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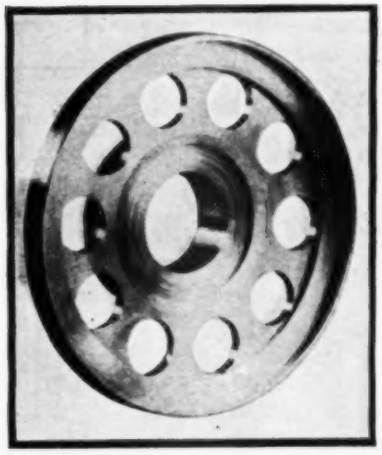


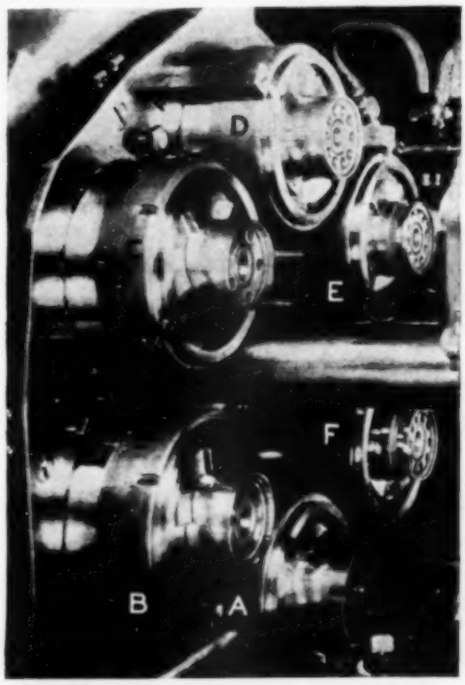
The job is a brass telephone electrode slightly over two inches in diameter with ten holes drilled in the flange. One part is made every 20 sec.

J. S. STULL
Hawthorne Works, Western Electric Company

Production Plus Precision

Certain adaptations and refinements are applied to a multiple-spindle screw machine to meet the need for exacting tolerances

THAT PRECISION manufacture in multiple-spindle screw machines is possible to a degree not ordinarily attempted, has been demonstrated as the result of an endeavor to produce a telephone electrode in the most economical manner. When first manufactured, the electrode was roughed out in a hand screw machine, drilled in a drill press, and routed back to the hand screw machines to be finished to size. Production was then stepped up with a single-spindle automatic screw machine tooled to combine the roughing, drilling, and finishing operations in the one machine. The success of this method and the quantity of the parts required annually suggested a multiple-spindle type of screw machine as the next improvement in production. Accordingly, a six-spindle machine, sufficiently fast and sturdy for the purpose, was selected. It was planned that the tooling should be modeled after that which had proved successful on the single-spindle machine. The prime consideration then was the necessity of producing parts within the close limits, shown in Fig. 1, in a six-spindle machine. The requisite precision was secured by means of a number of tools which were developed to compensate for the irregularities of the multiple-spindle screw machine. The set-up finally adopted resulted in a production of one piece every twenty seconds, approximately, and a maintenance of the limits specified despite the fact that some of the spindles were out of position considerably more than the allowed tolerances.



At *A*, the bar is fed to a stop; at *B*, the center hole is drilled and counterbored; at *C*, five flange holes are drilled; at *D*, the other five are drilled; at *E*, stem and outside diameter are formed; at *F*, the front and rear faces are finshed; at *A*, the part is cut off

In order to use the machine selected, it was necessary to design a number of other special tools, which will also be treated in this description. These are the special

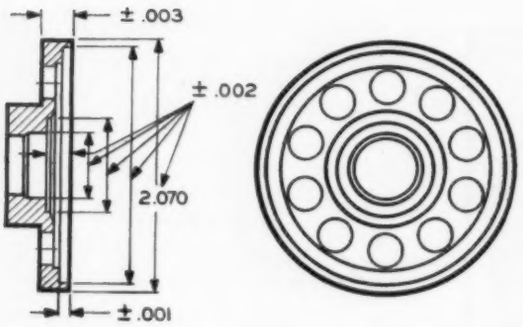


Fig. 1—One tolerance of plus or minus one-thousandth, five of two-thousandths, and one of three-thousandths make many operating precautions necessary

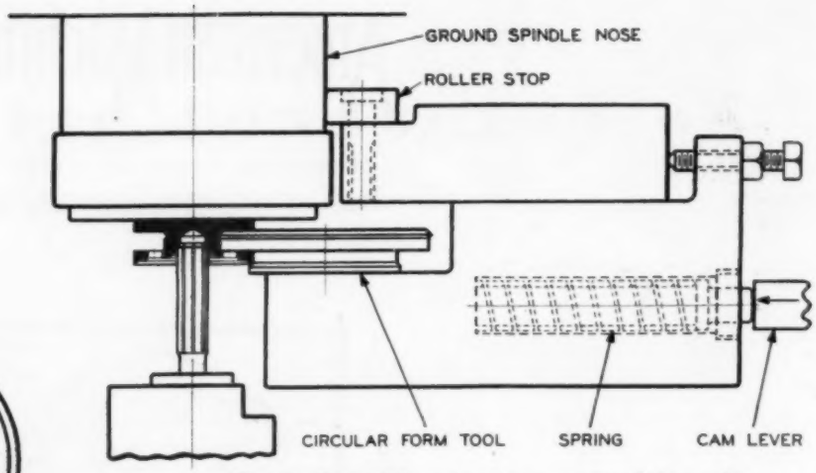


Fig. 2—Cross-slide operations are gaged from the spindle periphery. Thus inaccuracies in indexing are not transferred to the work

oversize stock-feeding arrangements, the method of engaging the drill heads with the driving dogs on the spindles, the provisions for inserting the stock without use of force, and the automatic stacker for the completed parts.

To obtain the required accuracy in the product and to circumvent the inaccuracies of the machine, the cross slide operations are gaged from the periphery of the spindle noses, which are ground to a uniform diameter. A ball bearing roller is mounted on each of the cross slide tools to act as a stop against the spindles. A stiff spring, interposed between the cross-slide cam lever and the slide, insures contact of the roller with each spindle and compensates for the variation in the machine. This is illustrated in Fig. 2.

It is obvious that individual adjustment for diameter of the product from each spindle is unnecessary. A single adjusting screw is provided for each cross-slide tool.

One of the requirements is that the faces of the flange

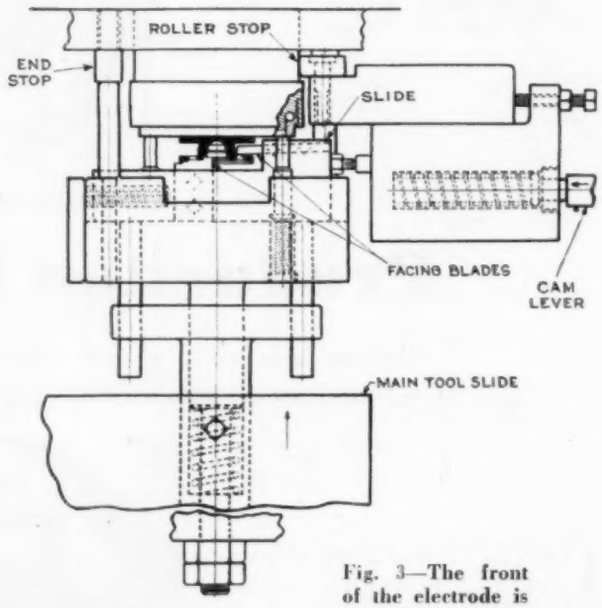
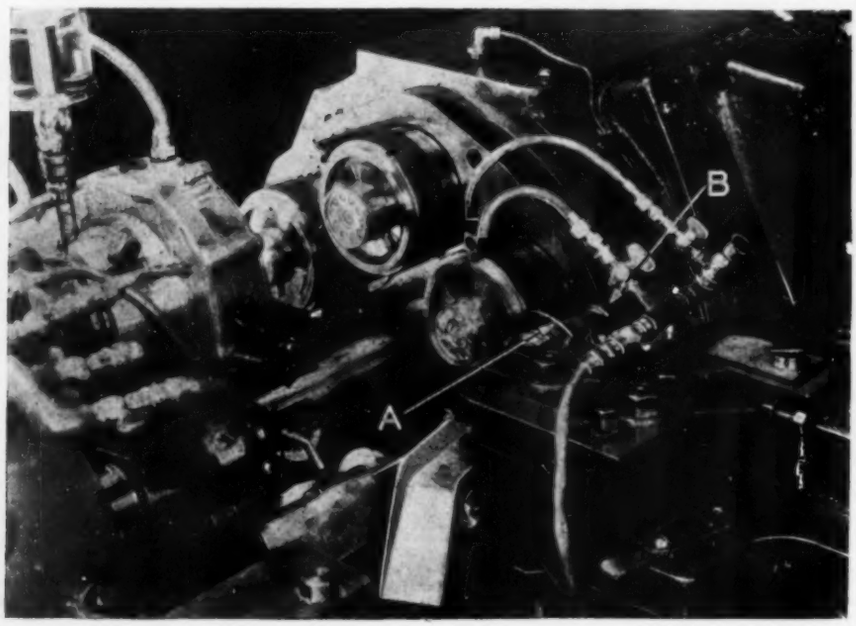


Fig. 3—The front of the electrode is faced by a form cutter. The rear is faced simultaneously by a cutter carried on the same cutter head but actuated by the cross slide



A circular form tool *A* is used, its inward travel being limited by the contact of the roller *B* against ground surface of the spindle

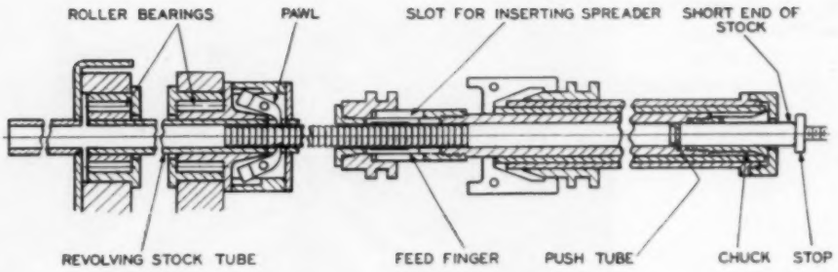


Fig. 4—Feed fingers at the rear of the spindle are used on the special oversize feeding attachment for 2¼-in. stock

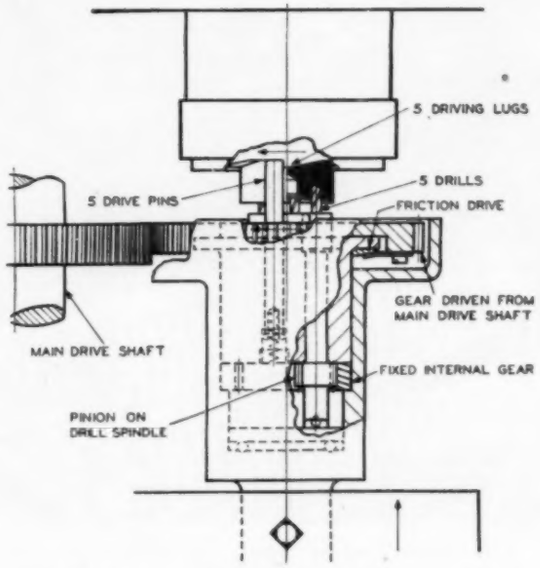


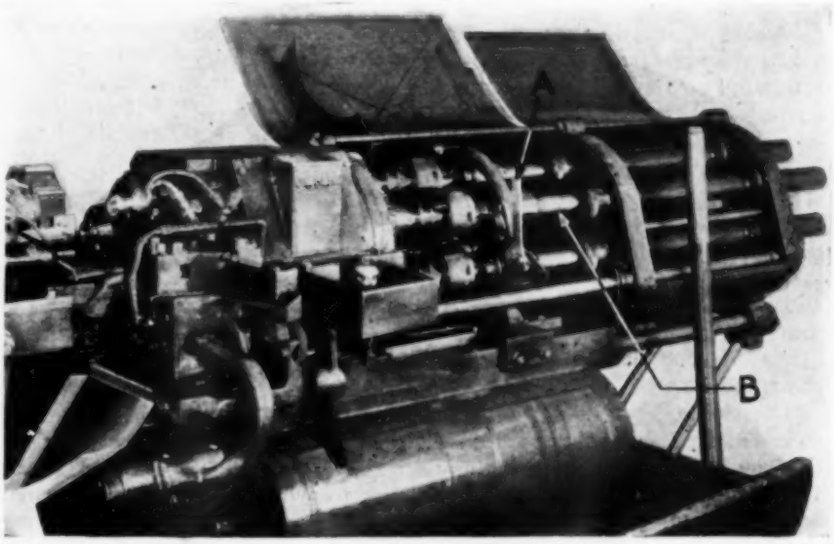
Fig. 5—The two multiple drill heads are driven directly from the spindle nose. When not in operation, they are maintained at a slightly lower speed through a friction drive from the center drive shaft

of the electrode be parallel. This quality is obtained by facing the sides of the flange simultaneously with a special facing tool mounted in the main tool slide and equipped with a cutter slide carrying the facing tools, front and rear. As the main tool slide is advanced, the rear facing tool passes and clears the periphery of the flange while the front form facing tool arrives at the center of the part. These tools are positioned in relation to the end of the work by end stops fastened to the spindle drum. After the facing toolholder is brought up to bear against these stops, it is held there by a spring between it and the main tool slide. This spring allows further advancement of the main tool slide for the benefit of operations in other positions of the machine. It is during this period that the cross slide feeds the facing tools across the work. It will be seen by reference to Fig. 3 that a cross-slide tool of the type already described is used to actuate the facing tool slide, gaging the diameter of the facing cut from the spindle nose. End play is eliminated from the spindle during the facing operation by spring plungers within the facing tool acting against a ball bearing thrust ring on the end of the spindle. This arrangement has the advantage of allowing end play in the spindle during the roughing operations, removing it only for the facing cut, which requires the greater accuracy.

As a comparatively small and fast machine with a rated capacity of 1¾ in. had been selected, special oversize feeding arrangements were necessary to handle the 2⅛ in. stock. The feed fingers were placed at the rear of the spindle as is customary with oversize feeding attachments (see Fig. 4), and a push-tube used behind the stock after it passed beyond the feed-fingers.

Continual hammering with the heavy rod stock to force it into the feed-fingers was found to have such a destructive action on the comparatively light machine that a new and milder method of loading had to be devised. Accordingly, openings were cut through each spindle to permit insertion of a spreading tool between the prongs of the feed-fingers. The spreader consists of two yoke-shaped members with lugs to enter the extra-wide slots of the feed-fingers and a cam lever to force the lugs apart. With this tool in place to hold the feed-finger open, the bar stock may be fed through the feed-finger without resistance. The push-tubes are inserted in the same way and as easily.

The position of the push-tube is maintained during the back stroke of the feed-finger by a ratchet and pawl arrangement. Pawls in the front end of the stock carrier engage with a series of ratchet teeth turned in the



Directly behind the extra push tube, leaning against the machine, are the revolving stock tubes. The feed finger spreader *A* permits free loading of the stock and push rods. *B* indicates the push tubes in place

periphery of the push-tubes, permitting travel of the tubes toward the chuck only. The operator disengages the pawls for removal of the push-tubes by the twist of a ring provided with an interior cam surface to release or engage the pawls.

A special, more substantial stock carrier equipped with roller-bearing tubes was installed. These tubes revolve with the stock, minimizing vibration and eliminating the marks which usually accompany a vibrating rod in a stock carriage.

There are ten holes to be drilled in the flange of the electrode. The tooling includes two multiple drill heads (Fig. 5) each of which drills five holes. In order to maintain the proper relation between the two sets of holes, the drill heads are driven by driving lugs on the spindle nose. The drill head pins through which the drive is transmitted are positioned in relation to the drills in each of the heads so as to space the drilled holes correctly.

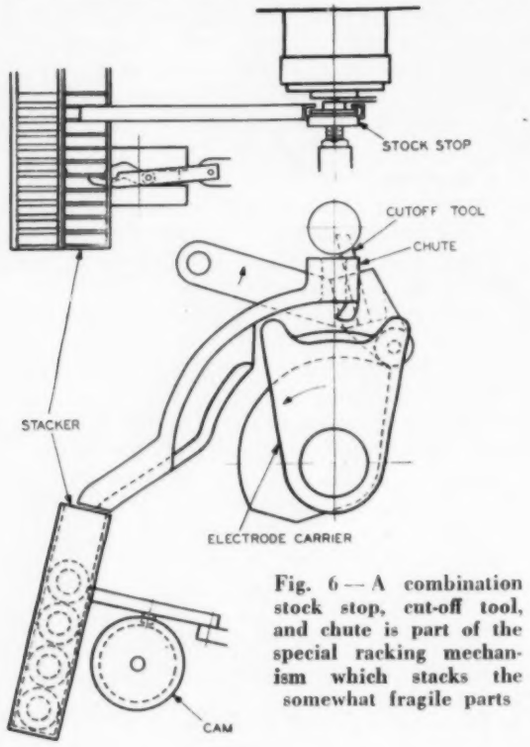
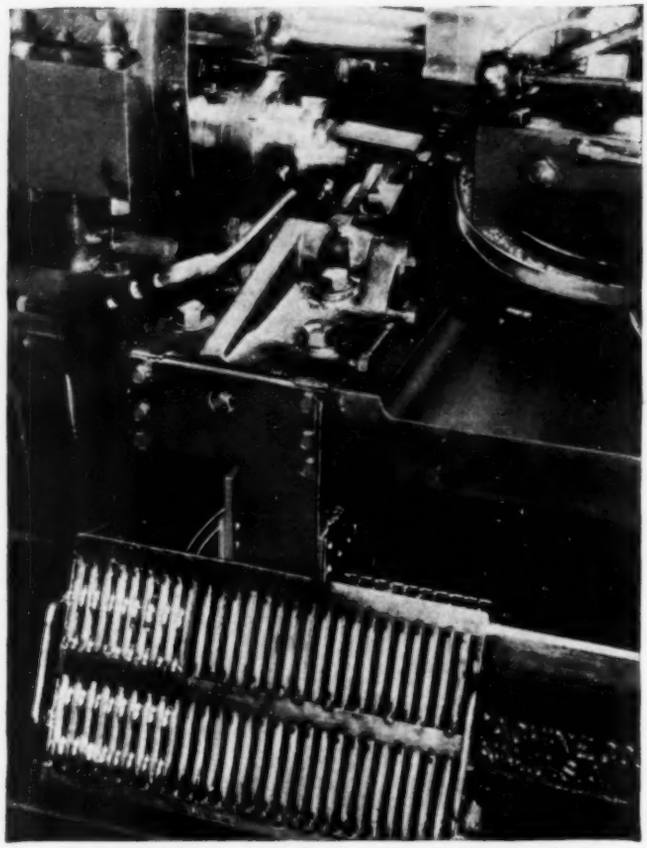


Fig. 6 — A combination stock stop, cut-off tool, and chute is part of the special racking mechanism which stacks the somewhat fragile parts

During their idle time, the drill heads are driven at a lower speed from the center drive shaft by gearing connected to the drill head with a friction drive. The step-up from this speed to that of the spindle is small enough to avoid clash when the drill head pins are fed in among the driving lugs. On the other hand, the increase in speed is large enough to insure that the lugs overtake the pins and that they maintain positive contact thereafter in order to position the drills. The difference in speed during the drilling operation is dissipated by slippage of the members of the friction drive. Engagement of the driving lugs on the spindles with the drill heads is accomplished without resort to modification of the spindle speed or direction.

The electrode, with its thin flange and heavy stem, is so constituted that it is easily distorted in handling after it is severed from the bar. As any such deformity might throw the parts outside the close limits to which they are machined, proper handling is essential. An automatic racking mechanism was devised to dispose of the severed part.



Twenty-eight compartments each hold five electrodes. The stock is advanced automatically after each compartment is filled

The tool in the bottom position (Fig. 6), a combination stock stop, cut-off tool and chute, is part of this mechanism. The cut-off tool slide is a special cam actuated arrangement; ordinarily this is not the cut-off position of the machine. The chute guides the finished parts into the stacker on the front of the machine.

This stacker is a 28-compartment removable box, each compartment of which holds five electrodes. After each compartment is filled, a cam-operated lever advances the stacker on its slide to present the next empty compartment below the chute. The parts cannot jam between the chute and the stacker as the electrode carrier times the interval of discharge. The stacker receives the parts without injury, relieving the operator of that duty, and enabling him to care for an additional machine.

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Positioning in Die-Casting Dies

LOUIS M. STEVENS, general superintendent, Veeder-Root Incorporated points out that accuracy in die castings can be maintained only if the dies are made so that the accurate dimensions on the cast piece will not depend on the mating of the die parts. That is, the piece should be positioned so that the accurate dimensions will not be perpendicular to the mating faces of the dies. High accuracy in tin-base die castings (0.0005 in. limit on small castings) has been held for 2,000,000 pieces on properly made alloy-steel dies.

A Gear Cutter Comparator

Discussion

The author further describes and defends his design of an apparatus for checking pinion-shaped cutters

SAM TRIMBATH
Gear Consultant

FRANCIS W. SHAW (*AM*—Vol. 75, page 803) suggests a modification of my cutter testing device (Vol. 75, page 296) and wonders why I selected the nominal pitch diameter and a rack tooth of nominal pressure angle instead of the base diameter and rack tooth of zero pressure angle. Briefly, this was done for practical reasons; either way is theoretically correct.

To amplify the above statement, first, I desired to avoid the necessity for precise location of a point at the end of contact lever tangent to the base diameter, when in a radial position. See Fig. 1. This is necessary according to data at hand, for devices similar to that suggested by Mr. Shaw, made in this country. To me it seems a quite formidable proposition, as in addition to location difficulties, a fine point on the contacting lever is easily mutilated and may acquire an appreciable dimension.

Second, I desired to make a comparison between cutters, which I have reason to suspect had tooth profiles not originating from the same base diameter. If this condition prevailed, I desired to match involutes on cutters for cutting mating gears, and by the simple process of matching cutter involutes, match the profiles on a large quantity of gears. It is not uncommon for a pair of cutters of this type to produce as many as 5000 pairs of gears. If two cutters showed no movement of the indicator when checking the profiles, I could be reasonably sure they were from like base diameters and had involute profiles. If they showed movement, I could not be sure, even though the indicator hand showed the same movement in each case and in the same direction.

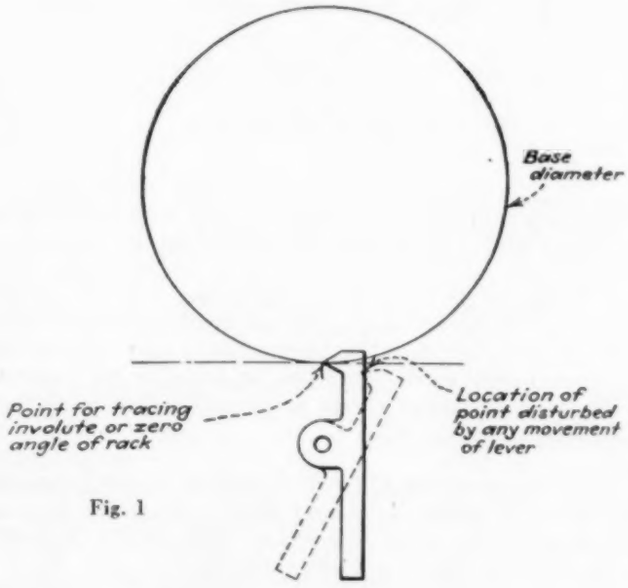

Fig. 1

To explain, suppose I desire to match precisely two involutes, and two are selected that cause the indicator to move three points in the same direction. One may be an involute originating from a different base diameter than the base disk on the testing devise, causing the indicator to move three points. The other may originate from the same diameter as the testing disk, but with a defect of three points somewhere on the effective addendum of the cutter teeth. Thus they would not be matched at all.

In considerations of this kind, it must be remembered that the cutter addendum produces a relatively small

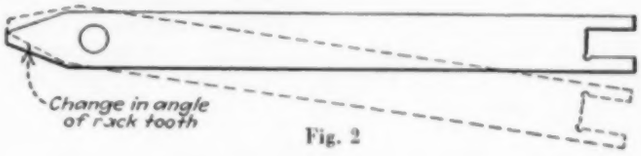

Fig. 2

portion of the gear tooth profile. So it became desirable to make our decision in regard to similarity of profiles, without movement of the indicator, and by so doing insure that we were actually dealing with involutes. To bring this about, using a base disk and zero angle of rack, would necessitate changing the diameter of the disk if a movement of the indicator occurred. While not an impossible procedure, it did not appeal to me as the most practical, inasmuch as the identical result could be obtained by using a pitch disk and an angle of rack tooth, which in turn would only necessitate changing the angle of rack. This can be quickly accomplished on my device as illustrated in Fig. 2. The next consideration was that we have a rack tooth of appreciable length of contact, and as the nominal pitch diameter and nominal angle of rack provided this, they were used.

Devices similar to the one described by Mr. Shaw are in quite common use in this country. The usual procedure being to specify certain limitations in regard to indicator movement. Careful resizing of the base disk is resorted to when greater assurance is desired. My device accomplishes the same result quickly and without dismantling any part of the device.

As stated in my article describing the device, cutters made according to present-day practice are usually involutes of some base diameter, so that the above considerations may not be quite as important as they were fourteen years ago when I designed it. However, I still believe they are necessary considerations, as experience through the intervening years has further convinced me that my original premise, "an involute can and should be checked without any indicator movement," was correct.

EXECUTIVE

Rolling Stones

Training courses designed to prepare young men for executive positions have become an accepted part of our industrial set-up. But do they always achieve the best results for the man and for the company? Do you believe that there is a tendency to train more men than can be absorbed in responsible positions? Does the plan lead to a system of seniority that eventually kills individual initiative? Is it better to hire new talent outside in order to avoid the danger of industrial inbreeding? Is a limited period of employment profitable to the man and to the company? What do you think about this executive problem?

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Suggested by James K. Matter

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HERBERT L. RAYMOND, President of the Cummings Electric Company, prided himself on being eminently practical. Indeed, he had few illusions concerning industrial affairs and tried never to let purely theoretical considerations govern his decisions.

"Can you spare me a few minutes?" asked Richard Carlson, Cummings' Personnel Director, as he entered the office.

"Certainly," Raymond answered. "What's new today?"

"Since I've been with this company," said Carlson, "practically all my work has been with the men in the shop. You have always dealt directly with the executives, both senior and junior. But it seems to me that we should have some kind of apprentice system for young executives as well as for shop men. Other companies in our line of business do it. They train men anywhere from six months to two years in organized courses. Then these men receive a further period of training in subordinate positions. In time, many of them are ready to assume posts of real responsibility."

"That word 'ready' you just used, explains one reason why I do not advocate the training of junior executives," said Raymond. "It's true that large numbers of young men are trained by some of our competitors. But when they're ready for more important jobs, the jobs are not always ready for them. That's because more men are put through the course than can possibly be used in responsible positions. They soon tire of their minor jobs and become restless and dissatisfied."

"Every man that takes a training course can't become a company official," said Carlson. "A certain percentage always leaves the company and some of the others are limited by their own abilities. But those who qualify for important duties more than justify the plan."

"I'm not so sure about that," said Raymond. "We have several men in this organization who were trained by other concerns. We're getting the benefits of their years of apprenticeship without the annoyance and cost of such a system. I believe they're doing better work for us than they would if they'd stayed where they started."

"I don't see why that should be," said Carlson.

"A man gets stale if he stays too long with one concern," said Raymond. "Take Dick Marshall for instance. As you know he went directly from college to the Standard Electric Company. He'd gotten into somewhat of a rut when he came with us, but otherwise, he was ready for some constructive work. A new job and new responsibilities restored his enthusiasm, and now he's one of the livest young men on our payroll."

"But couldn't he have gotten the same training right here?" Carlson asked.

"Technically, yes," said Raymond. "But from his standpoint it wouldn't be as good. These long careers with one company are likely to make a man narrow and soft. If my knowledge of young men is correct, after about three or four years, Marshall will begin to look at this concern as a second home. From then on his usefulness will decrease. It will be time to replace him with a man with a fresh viewpoint and new enthusiasm."

"I can see two faults in your policy," said Carlson. "First, it is based on the premise that a man works in flashes of brilliancy. I've known many men to turn out highly efficient work over a long period of years. Second, it's rather unfair to a man to obtain his best ideas and then turn him loose."

"It may seem hard," said Raymond, "but it's for the man's own good. He should have a diversified experience, especially while he's young. But usually he won't get it unless there's some compulsion."

FORUM

Discussions Of Former Subjects

Mourning Becomes Executive

A well managed business does not jog along on a margin of profit just wide enough to repay the efforts of its management or owners. It pays itself a bonus in the form of annual additions to surplus. Some of this surplus is wisely spent for improving the position of the business among its competitors, and the baalnce constitutes a reserve for the years when there is no profit. Yet many of those executives who follow this policy in the promotion of their business behave as if a bonus were as dependable as the rising of the sun.

Mr. Coolidge once stated that it was not the business of the government to guarantee its citizens prosperity. And no more can an industry offer that same assurance to its employees. It can only say, "Gentlemen, here is a method by which you can make more money while we are doing the same." Some bonus systems have been notorious for the unfair ratios established or for other abuses, but the bitter taste left in the mouths of most of us is caused by our spending sprees. We have eaten our cake and now blame the cook because he made it taste so darned good.

—H. D. Murphy.

Dominant or Dumb?

No surer way of breaking down the morale of a plant can be adopted than by setting up a dictatorship. Cooperation and enthusiasm are bound to disappear when a know-it-all sits on the throne. A man whose assistants are merely puppets for transferring his orders is certain to wreck the ship.

Years ago, I knew a man who tried to operate a machine shop on the one-man principle. He was despised by all who came in contact with him. Among other overbearing traits, he had a habit of making personal changes in the speed and feed of any machine that did not function according to his monarchial ideas. Disaster resulted from this trick one day, and this master-mind discharged the foreman of the department in which it occurred.

Dividends are produced more easily by having an attentive ear and an open mind. Even the newest apprentice will offer constructive advice at times. Make every employee feel his importance, regardless of how meager that may be. A word of praise for a good suggestion creates a fraternal spirit that spreads easily.

—Raymond H. Dauterich,
Crescent Engineering Company.

Self-Contained

There is no sense or profit for a company whose main objective is manufacturing machines to engage in other lines, such as carpentry, plumbing, steam heating, electric wiring, painting, decorating, or even tool die work. These activities were entered into by manufacturers in self-defense or the idea was sold by some person who saw the possibility of a steady job for himself or his friends.

In isolated plant there is no other course for a manufacturer to pursue but to keep as small a force as will do his repairs at minimum cost. The maintenance department is often a haven of rest for friends or men who "must be kept on," especially in dull times. When times are good, such men are transferred to the more "productive" departments.

It would be impractical, however, in most cases, for outside parties to do maintenance or repair work. If several calls were put in from different factories at once, someone would have to wait. The staff to handle all these calls would be beyond the capacity of contractors unless rates were made accordingly. No doubt a number of smaller concerns might be handled by one outside contractor, but he woud be much in the position of the fire department, which never can tell when a call will come and whether a hand extinguisher or the general alarm will suffice. For work that can be scheduled, outside contractors are the answer, but for emergency work, then the man on the spot.

—John S. Isdale, *Plant Engineer, International Silver Company.*

If an outside contractor is available, who is prepared to give a guarantee of service in line with the requirement of a company, his services are likely to be a sound proposition. The economics of each case need to be examined impartially, and above all, every factor affected must be considered without placing much weight on the matter of the company pride.

Many auxiliary activities of manufacturers are the specialist endeavors of other concerns which are likely to be more efficient. Electric power supply is often a bone of contention.

To do everything yourself has long been quoted as the one sure way. This is only justified if one has failed to find the outsider whom he can trust to give him the required service. Kipling has it that "he travels fastest who travels alone," which is only too true if the man be thoroughly capable and knows the way. Always it will be at some sacrifice. In the case of the manufacturer self-contained by belief and not by fact, his pocket will feel the results.

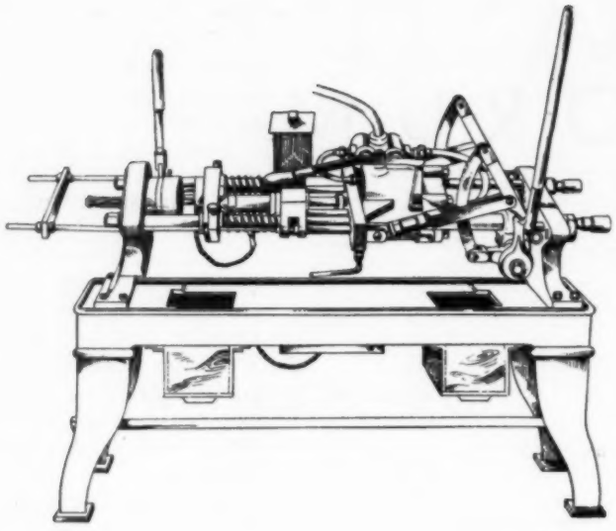
—S. A. Knight,
Manchester, England

Stockholder vs. Employee

It appears a rainy day has arrived for the Mid-City Machine Works. The logical thing to do would be to draw from the reserve fund which has been set aside to meet conditions which have recently developed.

If the employee's salary is further reduced, it not only curtails his buying power and works hardship to his dependents, but it will also seriously affect shop morale. If the dividend is passed, the market value of the company's stock will receive a serious set back. As the present crisis is only temporary, and the reserve fund can later be replaced, the company will do well to keep salaries at the present level, and also protect the stockholders by declaring the regular dividend.

—A. Tomlinson.



Air- and hand-operated machine produced by Eckert & Ziegler, in Germany, for use with acetate and styrol plastics. It is said to be capable of making 220 injections per hour

HERBERT CHASE
Consulting Engineer

Injection Molding as Practiced in Europe

The imminent advent in this country of the injection molding process for producing small, intricate parts, usually with difficult inserts, makes imperative a knowledge of the basic principles of the art as now practiced in England and on the Continent

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MANY INDICATIONS point to far-reaching effects from the development of the injection or the so-called "transfer" method for molding plastic materials. Although the method is not strictly new, its application to the phenolic and urea types of synthetic resins is comparatively recent. Moreover, its use with cellulose acetate materials has been increasing rapidly within recent years, especially in Europe, where machines for quantity production have been developed. Some of these machines are in use in this country and others are being developed here.

Several American companies are known to be experimenting with injection molding, but to date the question of patents has delayed the publication of information concerning the methods and equipment employed. This article deals, therefore, with European developments, some of which have been or soon will be introduced here.

Injection molding involves conversion of the molding material into a plastic state by the application of heat prior to its introduction into the mold cavity under high pressure. With a "true" plastic, such as cellulose acetate, which is softened by heating and rehardened by cooling, the mold can be kept cold. When materials such as the phenolic and urea resins are employed, the mold must remain hot during curing, but may be chilled before it is opened and the piece ejected.

Synthetic resins of the ordinary type cure and become permanently hard soon after they are rendered plastic by the application of heat. For this reason it is necessary, if they are to be used for injection molding, either to inject them immediately upon fluxing or else to change their characteristics so that they remain plastic for a considerable period. The latter alternative is the one adopted by the Société La Ronite, the leading French producer of synthetic resins for injection molding. This company's phenol-formaldehyde resins are termed "Ronisol," and those of the urea-formaldehyde type are called "Ronilac." Both materials are made in three grades; soft, medium and hard, and in a variety of colors, some of which are translucent. Both materials have the property of remaining partly polymerized for considerable periods, even overnight. Thus, they can be charged into the injection cylinder in considerable quantities.

The Process

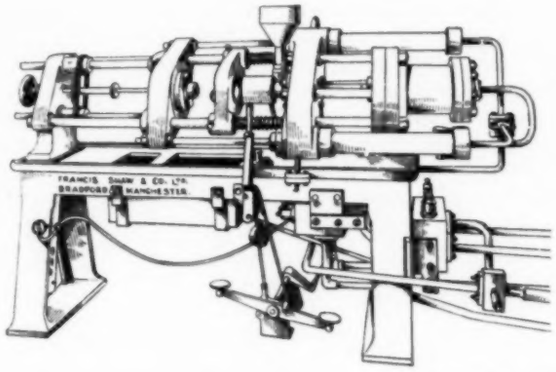
The process followed in molding synthetic resins varies slightly with the equipment employed, but is approximately as follows: The plastic is first softened by heating on a steam table to 212 deg. F. and then is loaded into an injection cylinder which is warmed to 140 deg. F. A mold heated to 212 deg. F. is placed under the injection cylinder so that its conical orifice registers with the cylinder bore. Injection is effected by a ram pressure of

4½ to 9 tons per sq.in., depending upon the plasticity of the material. About 10 sec. are required for this operation. The mold is then transferred to an ordinary heating press, where it is subjected to a pressure of about ½ ton per sq.in. and to the required molding temperature. Curing time is 30 to 50 sec. per mm. of thickness of the piece. After the mold is cooled for a few seconds, the piece is taken out. The time required for injection molding with synthetic resins is about the same as for powders, but by the use of multiple-cavity molds with means for automatic ejection of pieces, a rate approximating that of acetate molding can be attained. Presses required for curing are the same as those normally used.

The Mold

Except for the orifice, the mold is similar to one employed for molding with powder. It may have one or several cavities, which are gated from the orifice. The orifice, or the gate, is of such small section at the point where it joins the piece that the sprue can be broken off readily and will leave but a small mark on the piece. In general, this mark shows very little and will require no finishing. Fins on the work are very thin and can be removed by tumbling.

Of special importance is the fact that multiple-cavity molds do not require separate charges. Moreover, since the charge enters the mold in a liquid state, a hydrostatic condition is created—the pressure is equal in all directions. Consequently, there is no tendency to displace inserts, as when surging occurs with powder. It is also possible to mold intricate or thin-section pieces requiring a fairly deep draw.



Horizontal hydraulic press with semi-automatic features for rapid production of cellulose acetate parts by the injection process, manufactured by Francis Shaw & Co., Ltd., England

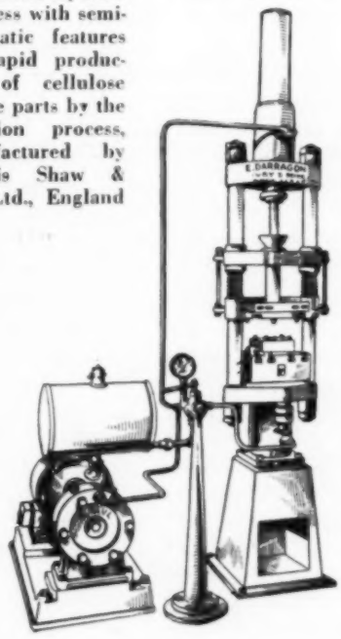
Presses especially designed for injection molding have been developed in France, England and Germany. One of these, built by Messrs. Darragon, Ivry-sur-Sein, France, has an individual motor-driven rotary hydraulic pump. The injection cylinder, arranged for heating by steam, gas or electricity, is supported by the two center crosspieces above the platen. Of the two cylinders, the lower one is for elevating the mold against the injection cylinder, and the upper one for operating the ram. This press is semi-automatic and can be used for acetate as well as for synthetic resins. A simpler form of press of the same make, having a single double-acting piston attached directly to the injection plunger, has also been used for synthetic resin injection.

Horizontal injection molding presses for acetate have been developed in England and Germany. One such machine, built by Francis Shaw & Co., Ltd., Manchester, England, is arranged for hydraulic operation, but similar machines of the same make are designed for pneumatic and also for hand operation. In the press shown, the cylinder is made from 4 to 6 in. in diameter and the working pressures are 450 to 600 lb. per sq.in. when using air, and up to 1,000 lb. per sq.in. when using hydraulic actuation. The two sliding heads or platens are moved to the right hydraulically to close the mold and to bring it into contact with the injection cylinder. The ram is operated by a plunger in the main power cylinder. At its inner end the injection cylinder is provided with a hopper for feeding the acetate molding powder by gravity. The latter is rendered plastic by the application of electric heat.

After the mold is closed, the ram is moved forward, forcing the plastic into the mold. The piece or pieces are chilled almost immediately to permit the mold to be opened at once. The machine illustrated is designed for molding single pieces weighing up to 2½ oz. or, in the case of multiple-cavity molds, a set of pieces having an aggregate weight of approximating this figure. A production rate of 200 injections per hour is said to be possible. In the case of tube caps, a 12-cavity mold gives 2,400 pieces per hour.

A machine built by Eckert & Ziegler, Germany, is very similar to that just described, and is now being marketed in this country. It is intended for use with acetate or styrol plastics. The pressure cylinder is designed for air operation at 400 to 500 lb. sq.in., and a control valve is placed near the center of the machine. This valve controls the return of the ram as well as its forward motion.

At the left end of the machine is a lever for closing and opening the water-cooled mold, and at the operator's right is another lever which advances the ram, cylinder and connecting linkage, bringing the discharge opening into registry with the mold opening and locking it. The air valve is opened and the ram forces the charge into the mold. The air valve is then reversed, withdrawing the ram. The right-hand lever is thrown back, withdrawing the ram and air cylinder still farther, and allowing a new charge of molding powder to drop from the hopper into the ram cylinder where it is heated electrically while the mold is opened



Vertical injection molding press constructed by E. Darragon, France, for cellulose acetate and partly polymerized synthetic resins. The injection cylinder is in the center of the press. The mold is brought into contact with the injection orifice by the lower hydraulic cylinder, and the ram for injecting the plastic charge is operated by the upper cylinder

and the molded part or parts discharged. This machine has a maximum capacity of 2½ oz. of plastic per stroke and can make as many as 220 injections per hour so that production is high with multiple-cavity molds.

Ability to use almost any kind of insert and to hold it in correct position without danger of breakage is one of the major advantages of injection molding. The fact that cellulose acetate, especially in the harder grades, has high dielectric strength makes it well suited for certain electrical parts. Since porcelain inserts can be molded in, the material has important applications in the electrical field. Certain grades of acetate also withstand temperatures as high as 400 deg. F. In the case of novelties, by using powders of mixed colors in the injection process, novel grained effects are produced as a result of the extrusion of the material through the injection orifice.

Among the cellulose acetate articles made by the injection process in Europe are such items as transformer spools, switch parts, spectacle rims, key guides, door knobs, syphon tops, pen and pencil parts, handles for brushes and other articles, and boxes of many types, as well as parts for telephones and other electrical apparatus.

Just how much of a transformation in molding practice the injection methods will bring about in the future is difficult to predict. It is clear, however, that it is likely to have far-reaching effects. For this reason, American makers of molded products who have not already studied the injection process and its possibilities will do well to give them early consideration.

NEW BOOKS

HYDRAULIC DRIVES FOR MACHINE TOOLS —*by E. Preger, Baurat Dipl.-Ing., 88 pages, 5½x8 in., with 183 illustrations. In the German language. Published by the VDI-Verlag, Berlin. Cloth cover. Price, R.M. 8.00*

Typically German in the thoroughness of its systematic presentation, this little book contains much valuable information on the subject of hydraulic drives applied to machine tools. Fundamental principles, types of hydraulic pumps and hydraulic motors, construction of hydraulic cylinders, piping, relief valves, and operating valves are presented in the first 25 pages of this book. The balance is devoted to 183 illustrations, most of them diagrams, showing hydraulic applications to various machine tools. Captions give a complete explanation of the arrangements illustrated.

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SYMPOSIUM ON MALLEABLE IRON CASTINGS—*Papers presented at joint meeting of A.F.A. and A.S.T.M., in Chicago, Ill., June 26, 1931. 122 pages, 6x9 in. Paper covers. Many illustrations and tables. Published jointly by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa., and the American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. Price, $0.75.*

The symposium in which the papers and data published in this book were given was a session of the A.S.T.M. Annual Meeting, its purpose being to provide the engineering profession with authoritative data in concise form on the properties of malleable iron and castings poured from this metal produced by best present methods. This book contains the thoughts and practical ideas of many leaders in the malleable iron industry, many of whom with their companies have contributed data and information for inclusion. The committee which prepared the book has reviewed critical data on malleable iron from diversified sources and compiled an authoritative summary of the known chemical, physical, mechanical and electrical properties of malleable iron. The book includes an introduction which defines the material covered and points out the major points in the symposium. An extensive section on the manufacture of malleable-iron castings, available data on the properties of malleable iron, much of it heretofore not gathered in concise form, and a variety of other sections including material on higher strength malleable iron, cupola malleable iron, and the necessity of cooperation between engineer-design and foundry, all are incorporated. A resume of current specifications for malleable-iron castings is also given .

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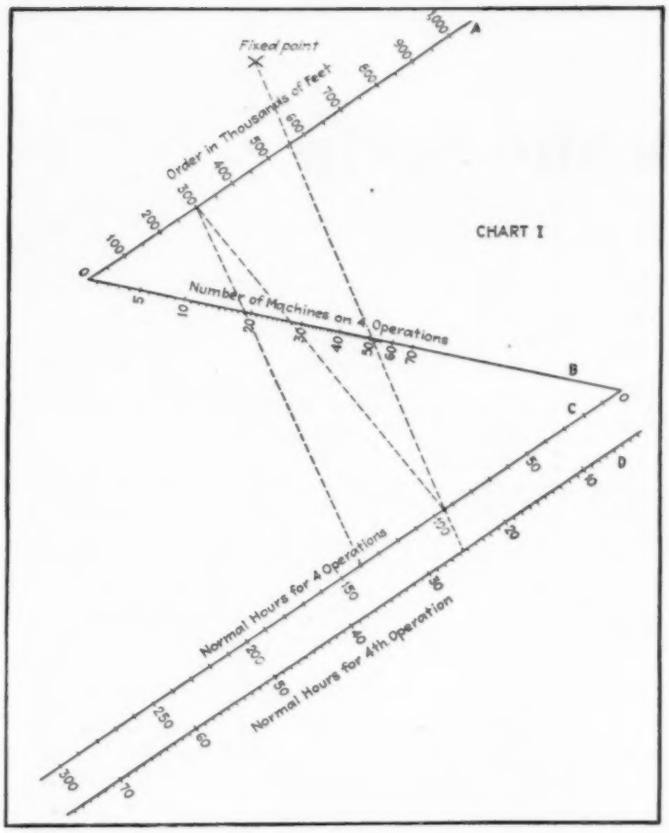
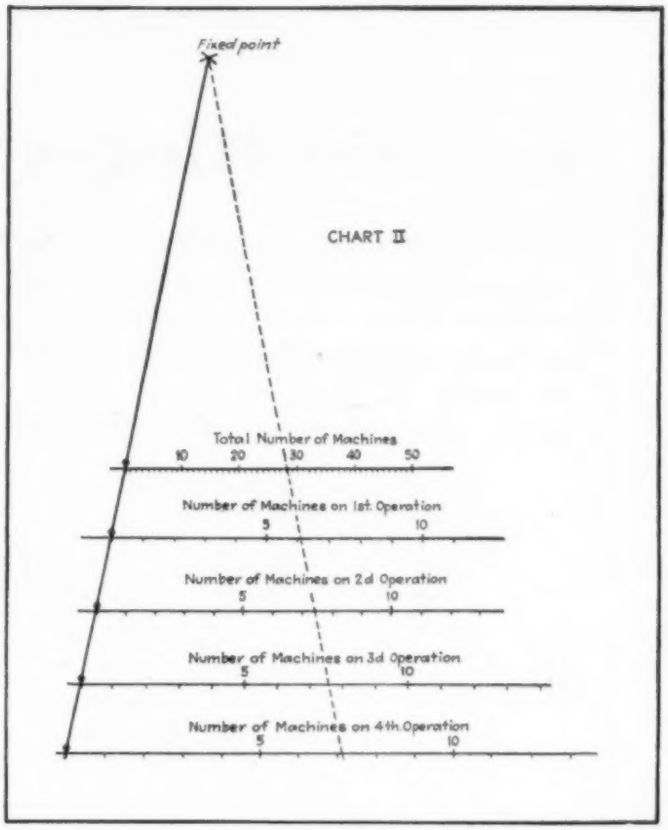
KINEMATICS OF MACHINERY—*By C. D. Albert and F. S. Rogers, professors of machine design, Cornell University. 527 pages, 6x9 in. Cloth-board covers. Indexed. About 600 illustrations. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $4.50.*

This volume, an outgrowth of the authors' teaching experience, is an up-to-date and differently presented handling of a standard subject. It endeavors to emphasize, in line with the present trend toward increasing speeds in machinery, certain aspects of cam and gear design and includes a method of determining the linear velocity and acceleration of any point in a mechanism and the angular velocity and acceleration of any link. Primarily for a 45-period college course, it also includes additional kinematics necessary for a course in advanced kinematics and kinetics. The book presupposes a course in engineering mechanics, as most present day texts in kinematics do; thus it may offer hard going to the inquisitive executive whose mechanics is but a memory.

It appears that the authors have succeeded in their effort to present each subject completely and yet concisely. Considerable attention has been given to the form of mathematical developments, convenience of notation used, and to the suitability of the many illustrations.




Fixed point
CHART II
Total Number of Machines
Number of Machines on 1st Operation
Number of Machines on 2d Operation
Number of Machines on 3d Operation
Number of Machines on 4th Operation

Scheduling By Graph

Planning for certain quantity production operations may be simplified by the use of charts

A CONVENIENT method of balancing productive capacity against orders is always desirable. Where the product and means of manufacture are standardized, the problem may often be solved most quickly by graphs.

The accompanying diagrams illustrate a specific instance where this method has been applied to advantage. The process consists of four operations, and the product is sold in units of a thousand feet. However, the same sort of analysis could be applied for pieces or any other unit. An example will best explain the procedure.

Assume the order calls for 300,000 feet and that 19 machines are available for all four operations. The 300 mark is located on Scale A and the 19 mark on scale B. A straight edge is laid on Chart I intersecting these points and crossing Scale C. The corresponding point on Scale C will be found to be 140, which means that 19 machines will require 140 hours to complete the order.

But suppose it is necessary to finish the 300,000 ft. in 2 weeks or a total of 96 hours. Lay the straight edge so it will intersect Scale A at 300 and Scale C at 96. It wil be found that in this position, the reading in Scale B will be 28, that is, 28 machines will have to be put on the job to meet the required delivery.

Scale D is used for determining the total hours for the fourth operation. To do this, determine the hours for all four operations as before, and connect the fixed point with the total hours as indicated on Scale C. Then the intersection on Scale D will give the time for the operation. Thus 96 hours for all four operations means 26 hours for the fourth operation alone.

Chart II provides a method of distributing the machines after their total number has been found. Suppose, that as in the previous example, Chart I shows 28 machines will be required. How many shall be put on each of the four operations?

With one end on the fixed point, the straight-edge is made to intersect the upper scale at 28. Then the four lower scales give the machine requirements. These show six machines for the first operation, seven for the second, eight for the third, and seven for the fourth. Thus the two charts give a complete analysis of the machines needed for a certain order.

The charts given are of course applicable only to a specific product. But the same principle may be applied to a wide range of production jobs.

Punching Hinges in the Strip

Considerable attention is being given to saving time and material in punch press work. An example of such work is the operation here described, which finishes a hinge complete, with its pintle in place, at every stroke of the press. The only waste is from the screw holes

CHARLES F. SMITH
Consulting Engineer

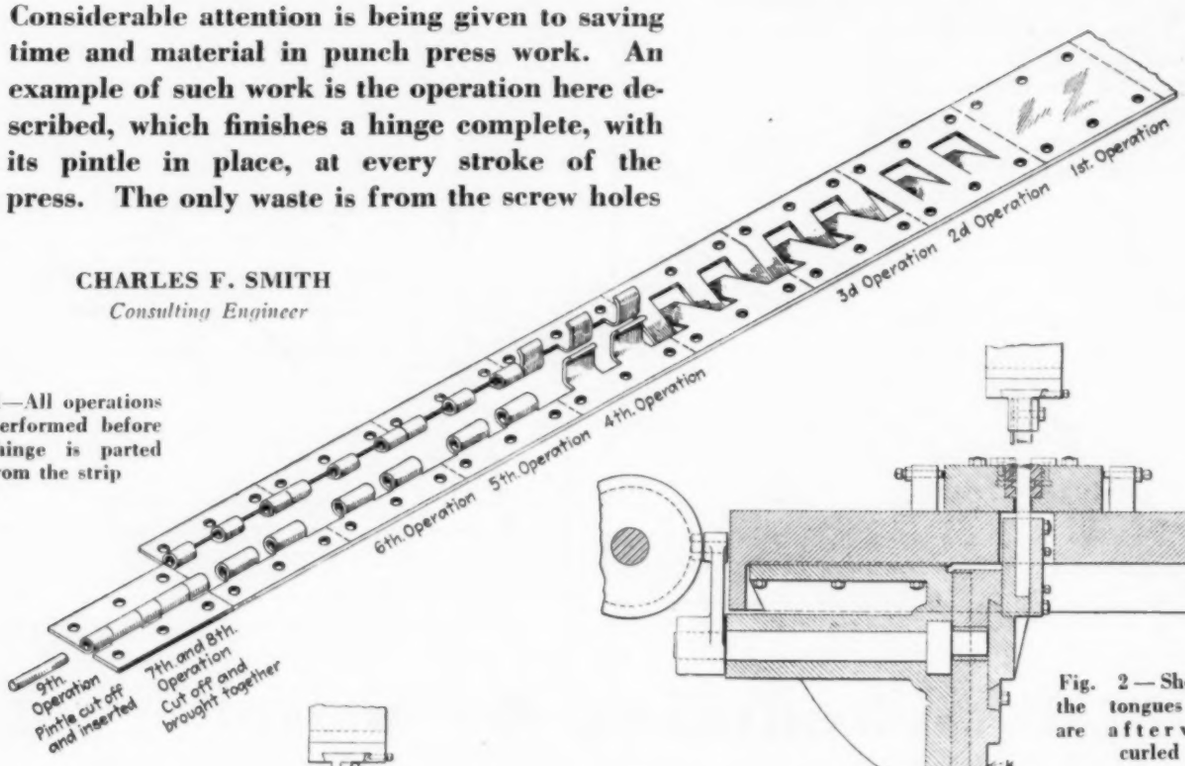


Fig. 1—All operations are performed before the hinge is parted from the strip

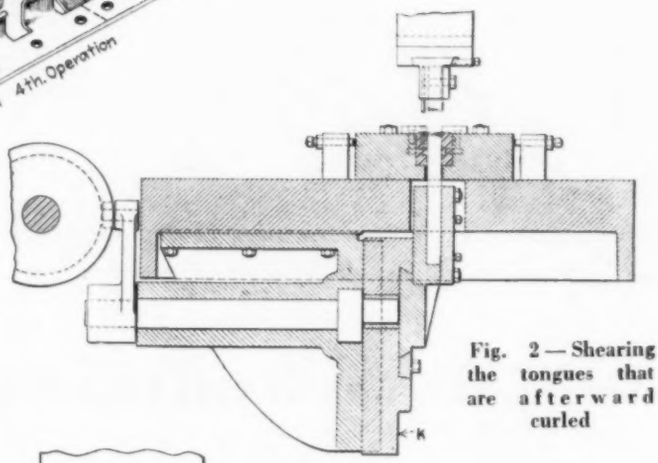


Fig. 2 — Shearing the tongues that are afterward curled

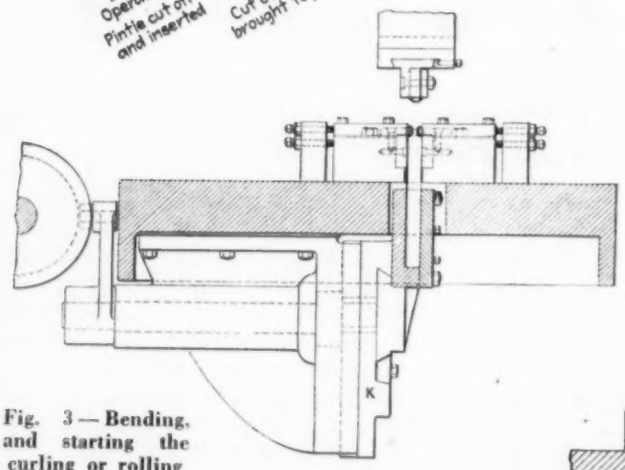


Fig. 3 — Bending, and starting the curling or rolling

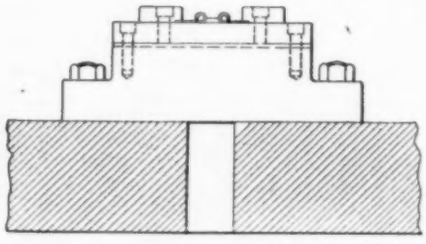


Fig. 4—The finishing operation on the eyes through which the pintle is pushed

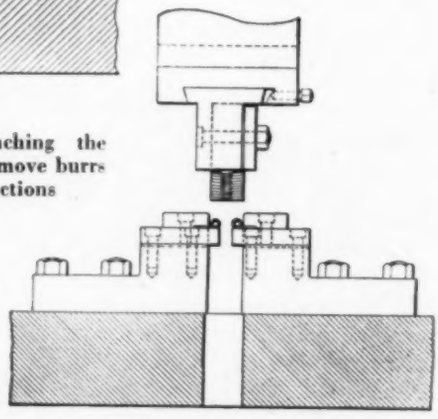


Fig. 5 — Broaching the openings to remove burrs and projections

AN EARLIER article under a similar title (*AM*—Vol. 75, page 522) showed a process for handling pieces that had been entirely severed, pressed back into the strip and carried along to the different stations of operation. In this case the process is reversed. The operations are completed before the piece is severed from the strip, and in this particular instance there is virtually no waste of stock.

The feeding of the strip, together with the wire for pintles, is done by rolls. The top roll of the pair that feed the strip is raised at each stroke of the press to

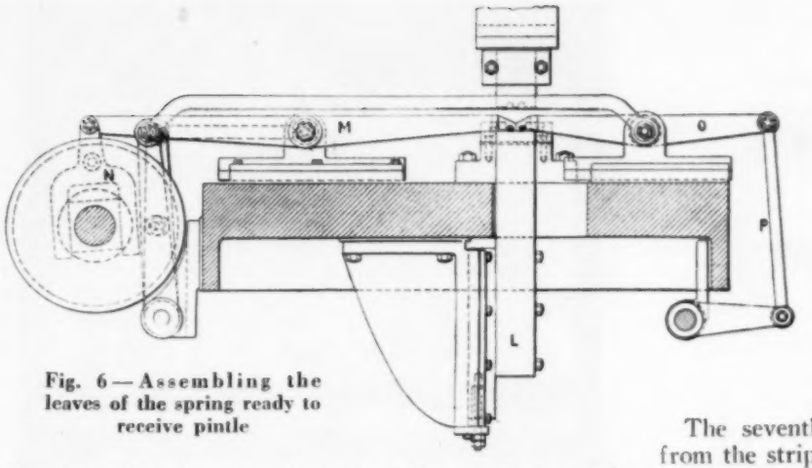


Fig. 6—Assembling the leaves of the spring ready to receive pintle

allow the pilot pins to register the strip and drops again to feed the stock into position for the next stroke. The first operation punches the screw holes. These are later used in locating the strip. The second operation shears three sides of the wide portion of the hinge joint, leaving one side attached to the strip.

The third operation shears the narrow part of the hinge joint leaving the halves attached to opposite sides of the strip. This operation leaves the sheared parts bent slightly downward. To clear these bent portions the lower punches or tools are mounted in a slide *K*, Fig. 2, which moves down enough to clear the bent portions, also the forming tool for the next and fourth operation that forms part of the hinge joint.

When the slide *K* moves up it brings the forming tools level with the face of the die, and the punch for the fourth operation forms the first part of the hinge joint. The slide comes to rest and the punch finishes the operation. The fifth operation completes the rolling of the hinge eye.

Rolling the hinge causes the ends to bulge to a slight cone shape, and the sixth operation broaches the space between the eyes to remove the excess stock and to make the spaces the proper size.

The seventh operation cuts the hinge portions clear from the strip. The slide *L*, Fig. 2, has a heavy spring which holds the hinge straight for cutting off, and brings the hinge back to its original position. In the next operation one half of the hinge is moved forward by the lever *M*, Fig. 7, to line up with the stationary half. The fork *N* moves the lever *M* forward to accomplish this.

In the ninth, and last, operation the pintle is inserted by the wire feed. The pintle has been previously cut off on the back stroke of the cutter and left in a cut-off tube so that when the feed comes forward it is forced into the hinge. After the pintle has been inserted the lever *O* moves the completed hinge off the slide *L* and drops it through a hole in the bed of the machine.

Ambridge Test of Paints for Water Tanks

PITTSBURGH Des Moines Steel Co. and the Borough of Ambridge, Pa., who are jointly conducting an extensive test of paints for the interiors of water tanks, have announced the result of the fourth inspection of the 196 paint panels made Jan. 15, 1932, after one hundred days' exposure. Following are the average ratings for various groups of paints into which the panels have been classified:

Classification	Average Rating For Class Per Cent
Red Lead and Linseed Oil Paints	93.3
Other Linseed Oil Paints	74.3
Synthetic Gum Vehicle Paints	78.0
Pyroxolin Base Paints	56.0
Gilsonite Asphalt Paints	70.5
Coal Tar Paints	86.9
Asphalt Emulsions (Plain)	85.0
Hot Bituminous Coatings	98.9
Thick Plastic Coatings	84.8
Elaterite Paints	89.0
Clear Varnish Finishes	84.2
Aluminum Paints	88.4
Miscellaneous Cold Bituminous Paints	73.8
Asphalt Emulsion and Filler	77.5

	Oct. 15, 1931 Per Cent	Jan. 15, 1932 Per Cent
Average Rating of Unclassified Panels	92.0	77.3
Average Rating of All Panels	94.6	19.9

The latest inspection was made Feb. 15. Results of the previous inspection appeared in *American Machinist* on page 895, Vol. 75.

NEXT WEEK

Just who fired the initial shot in the long war between the shop and the cost department is still a question. But there is little doubt about the shop's desire and demand for simplicity in cost accounting. Albert E. Grover has turned out an article on simplified profit reports, and you will find it in the next issue all set and ready to record the profits when they start rolling in.

The next issue, as a matter of fact, will cover a greater variety of interests than usual. The factors for securing accuracy in automotive production will be analyzed and illustrated by Prof. Gwiazdowski. Walter Wells will have more to say about Soviet Russia. Herbert Chase will describe a slotting die that is new to us. E. Chat Shanks will provide new data on caliper measurements. There will be two pages on how to weld certain shop equipment and a fact-filled article on welding Everdur pressure vessels. Ideas from Practical Men have never been more practical; the Reference Book Sheet will be double, covering the graphical determination of both blank diameters and blanking pressures.

IN A. M.

Automobile Production Control

DEAN S. FIELDS
Supervisor of Production Control Department, Graham-Paige Motors Corporation

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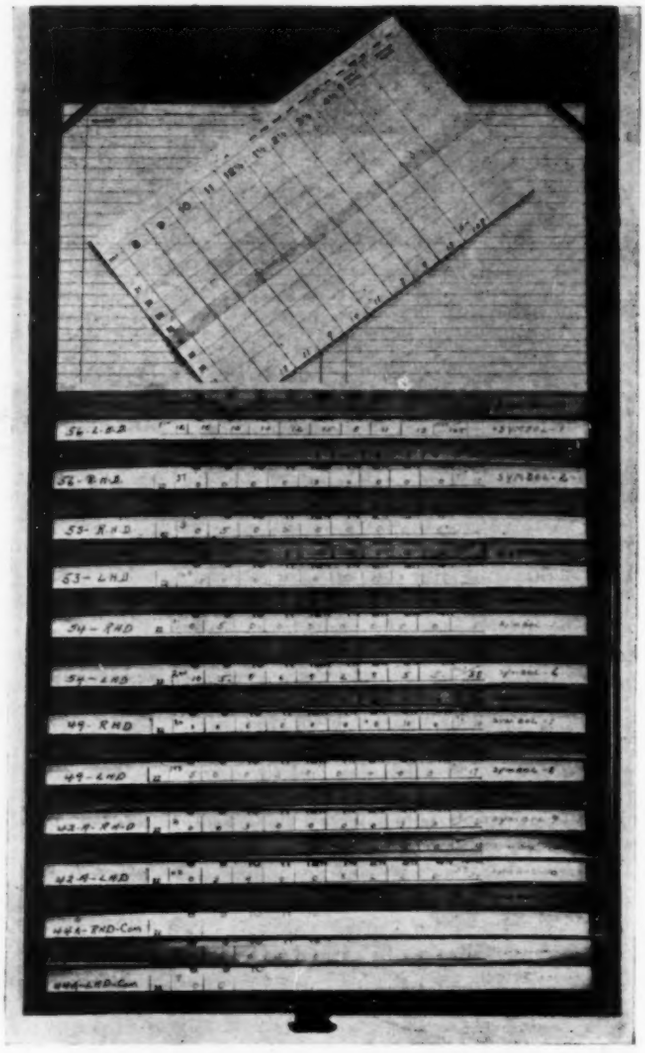
In his first article, which appeared last week, the author described how bodies of a great variety of type and color are routed. He now relates how the motor and chassis schedules are made to coordinate with the body schedule



A double indexing system gives an instant comparison between the total number of motors becoming available and the accumulative total of each type scheduled for use

WE USE the body schedule as a guide to show us what body types are to be available for the day, and the order in which they will be available for scheduling. Next, we refer to the permanent order count to show us what motor and transmission type is needed for these bodies. We then make out our motor schedule for these items and transmit it to the motor assembly stations.

This motor schedule gives the following information:

1. Order number
2. Amount of motors on the order
3. Motor model number
4. Drive (right or left)
5. Motor symbol number.

The key man at the initial operation checks carefully the type and amount of cylinder blocks put into the system. He also uses care in painting the proper symbol on the end of the cylinder block, so that from his station, on through the assembly, the other key men need only to refer to this number as a guide for their operations.

A cross check record is kept in the production control office, to insure that at no time will motors be scheduled for use in the final assembly line in excess of the amount available for their use. This check also insures that no motor will be scheduled for final assembly use, before it is actually ready for them.

We keep this check by means of a visible Kardex record; on one colored card in this index we show the accumulative total of motors becoming available for final assembly. This total is shown for each type of motor, both hourly and daily. Directly underneath we have another colored card which shows the accumulative total of motors of that type being used, both hourly and daily. By comparison of these two cards, we are able to see at a glance whether we have scheduled motors for use in final assembly, ahead of the time they actually become available. If such occasion should arise, it is a simple matter to rearrange our schedule so that the two times will coincide.

Merging the Schedules

Last in order of scheduling comes the final car assembly. This schedule also covers the sheet metal assembly, enameling, painting, and the hood painting departments. The successful merging of these items, various assemblies made in the car assembly department, and the major units of bodies and motors, depends upon the making out and strict adherence to this schedule.

This master schedule, when made out, shows the following detail:

1. Order number
2. Amount of cars on order
3. Chassis symbol number
4. Body type
5. Body color and trim
6. Drive (right or left)

7. Transmission type
8. Frame and sheet metal color
9. Wheel equipment
10. Wheel color
11. Tire equipment (if not standard)

In symbolizing in this department, we use the engineering model number for designating chassis types, instead of writing out the model name in full. All other detail pertaining to colors, wheel equipments, and other specifications is not symbolized, although in many cases abbreviations are used. In making out this schedule, we use several subsidiary records as a guide and a check in seeing that no mistake has been made.

The first of these, as previously mentioned, is our permanent inventory of orders and cars on hand to apply against these orders. Each morning, after the previous day's shipments have been deducted and the new orders added, we make up a new sheet for each model. This shows the number of cars on hand completed and in the process of building, as applied against the permanent order count. Using this as a guide to show what wheel equipments are needed on the various colors and body types and using the body schedule as a guide to show us the bodies, types, and colors, that will next be available for assembly, we proceed with the making up of our final schedule.

This schedule, when made up and forwarded to the various departments via our Telautograph, is received by them will in advance of the time that the individual assemblies will need to be ready for the main assembly line. This, of course, is necessary when you are working without any bank of assemblies ahead of the main assembly line. As a rule, about one and one-half days elapse from the time of scheduling until the first car on the schedule rolls off the assembly line as a completed car, so that all departments have sufficient time to perform the work required of them.

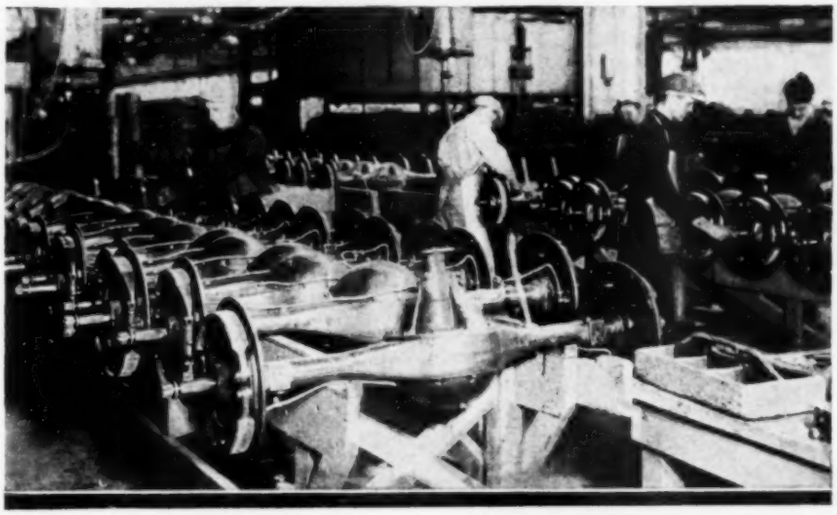
The Frame Assembly

Having made out the master schedule, we forward it over our Telautograph in three different groups. The first group is the frame assembly which also takes in the front and rear axle assemblies and frame painting, the sheet metal assembly, enameling and painting, and the motor assembly. To these departments we give all the information on the master schedule except that on body color and trim, wheel color, and tire equipment.

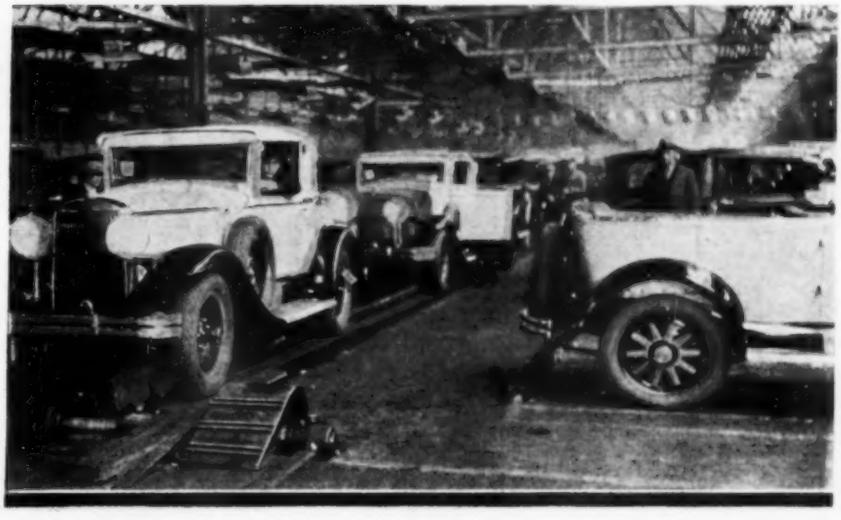
The motor department uses this information as a check in getting motors okayed in the block test department and arranging them in the proper order on the conveyor leading to the final assembly department. The sheet metal department uses the information as a guide in assembling, polishing, and enameling, or painting, the various types of sheet metal in the order called for on the schedule.

The frame assembly foreman posts the information on the schedule on the blackboards at the various key stations in his department. Frames and axles are assembled in the exact order specified on the schedule and come together in one unit at the point where the chassis starts on the conveyor through the classis paint oven. The key man at this point checks the frames carefully against the schedule and paints on the frame side rail the color to be applied to that chassis when it reaches the chassis paint oven. At that point, the painters have their paint guns to correspond with the colors desired and spray them on the chassis.

Each key man, in the various de-



Axles are assembled on specially designed benches. They are then mounted on the frames and go on a conveyor through the chassis paint oven



Despite the great number of body and chassis combinations, the control system has been worked out so that only four men are required to schedule 500 cars a day

partments where the schedule is posted, checks the material against the schedule as it passes his operation, so that the proper type and amount enters the system. In our second group, we take in the hood painting and the body wiring departments. To these departments, we give all detail on the schedule, excepting those applying to wheel equipments, wheel colors, and tires.

Handling the Hoods

In the hood painting, we have a small amount of hoods which have been primed, ready for surface and lacquer coats. This bank is replenished by the sheet metal department, using the information received on the schedule for this purpose.

From the information received on the schedule, the key man at the first operation, working from the bank of primed hoods, hangs on the conveyor the proper amount and type of hood halves, in the exact order in which they are scheduled. The painter in the first spray booth, as the hoods pass him, applies the first coats of the proper lacquer color and checks the amounts against the schedule to insure getting the right amount of each color in accordance with his instruction.

From this point on, the hood halves proceed through the various other operations without checking, except when some repair is necessary. If the repair can be made in a short time, the hood is repaired without delay. If the repair cannot be made immediately another hood is brought through to replace the one damaged. The body wiring department unloads the bodies as they are received from the body plant, assembles the wiring and instruments, and arranges them on their line in the order they are scheduled.

Shipping the Bodies

As mentioned before, the production control office schedules the shipping of the bodies from the body plant to the main assembly plant. At the time the master schedule is made out for the final assembly plant, the schedule clerk posts a chart which shows the type, color, and trim details of the bodies needed each hour in the body wiring department. This information is given to the body shipping clerk, who in turn furnishes the production control office with the contents of each load of bodies shipped hourly by him.

Using this information as to shipments, the clerk checks off the bodies shown on the chart, so that at all times he can see at a glance how many bodies are ahead of the body wiring assembly, and if any body is delayed in shipment, he can get in touch with the body plant and have pressure brought to bear on that particular body to get it out immediately.

The body wiring department, as a last operation, arranges the bodies on a conveyor which travels to a point where they are lifted on a crane and dropped to the chassis below. Careful checking is employed at the point where they enter this conveyor line, to be sure that the proper amount, type, and color as scheduled are put on this line, because a mistake here would likely result in expensive delays or changes on the chassis line.

Wheels and Tires

The third and final group on our schedule broadcast are the wheel painting, wheel and tire assembly to chassis, steering gear assembly, finished sheet metal assembly, radiator assembly, and hood assembly. All information contained on the master schedule is give on this broadcast.

The wheel painting department uses the information on the schedule as a guide only in striping and finishing its wheels and arranging them in the proper order in the drying ovens. The actual scheduling of wheels into color is handled separately.

Ahead of the assembly line, we carry about one day's bank of wheels. This, of course, is because of the time needed for paint drying. At the time the master schedule is made out, we tabulate the total amount and color of each type of wheel to be used on that schedule and give the wheel paint foreman an order to paint them. These wheels must be in color, ready for striping, one day after order issuance. By employing this method, we have our wheels ready for striping about one half day in advance of the time they are to be used. Using the schedule as a guide, the wheels are striped, arranged in racks in the order scheduled, and put on the conveyor leading to the wheel and tire assembly.

Assembled in Specified Order

Acting upon information conveyed in the schedule, all the departments above mentioned proceed with the assembly of units in the exact order specified. When completed, these units are taken to the main assembly line by means of conveyors or specially constructed racks.

At the point where the chassis leaves the drying oven, the wheels are assembled, and the chassis is then lifted to another assembly line. The different units which have heretofore been scheduled are assembled to it on its trip down the line. The order of assembly is as follows: steering gear, motor, finished sheet metal, body, radiator and hood. All of these items have been ready and are waiting for the chassis when it passes the individual assembly operations.

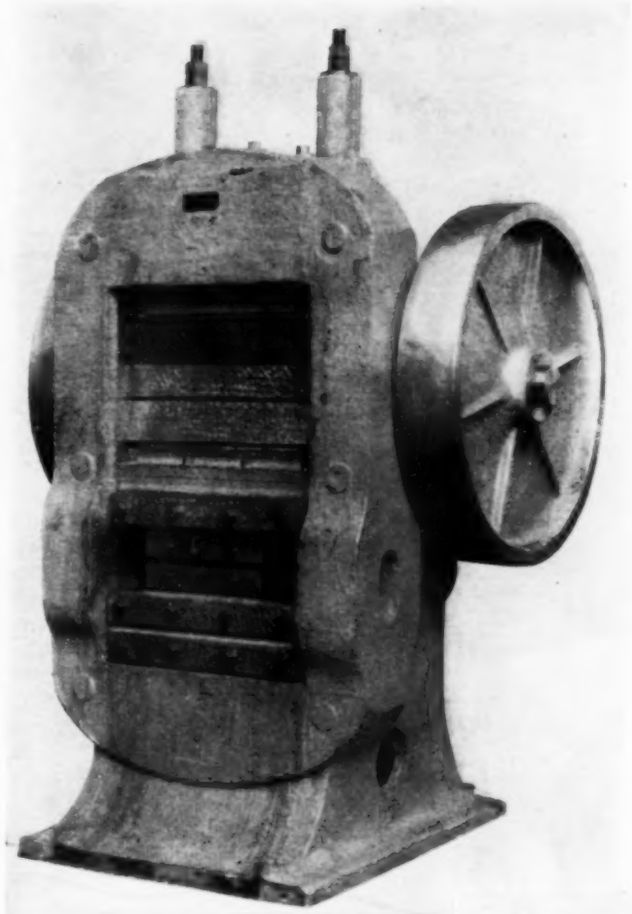
At the time the last group of departments receive their schedule, the car distribution office and the car shipping office also receive a copy of the same schedule. Using this schedule as a guide, the car distribution clerk releases to the car shipping office enough car shipping orders to cover the cars made available by that day's schedule. After the car has left the assembly line, it goes through the testing department, and being pronounced okay for shipment, it is turned over to the car shipping, where it is applied against the car shipping order and leaves the plant on its way to the ultimate buyer.

Simple but Effective

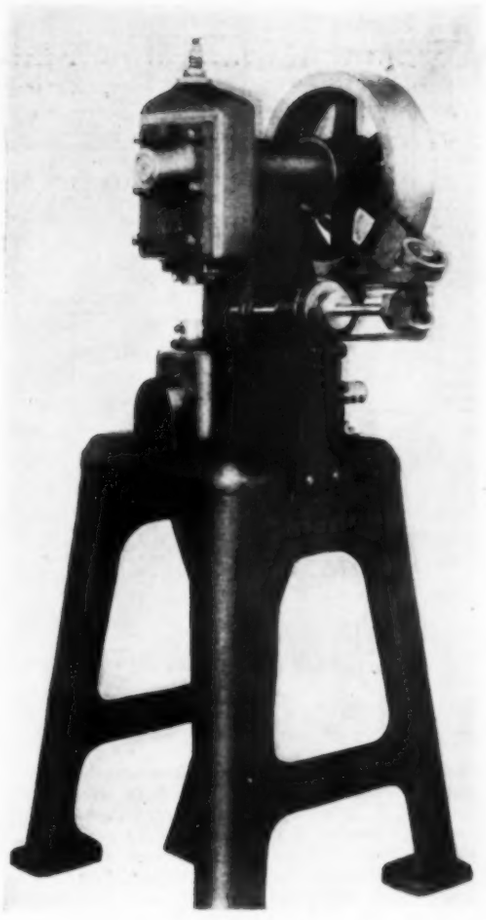
While this system as outlined may seem somewhat detailed and complicated, in reality it works out smoothly. The best proof of this fact is seen in that only four men are required to handle a production up to 500 cars per day.

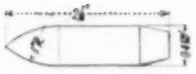
In summing up, it must be noted that this, or any other system, will not work by itself. To be successful, any system must be fundamentally sound and cover all details of the subject which you desire to control. It must be simple enough to be readily understandable by those responsible for its application to the job. Finally, those responsible for such application must see that the work proceeds exactly as scheduled. When these principles are strictly adhered to, you have the secret of success in any similar control system.

Machine Swaging as a Modern Art



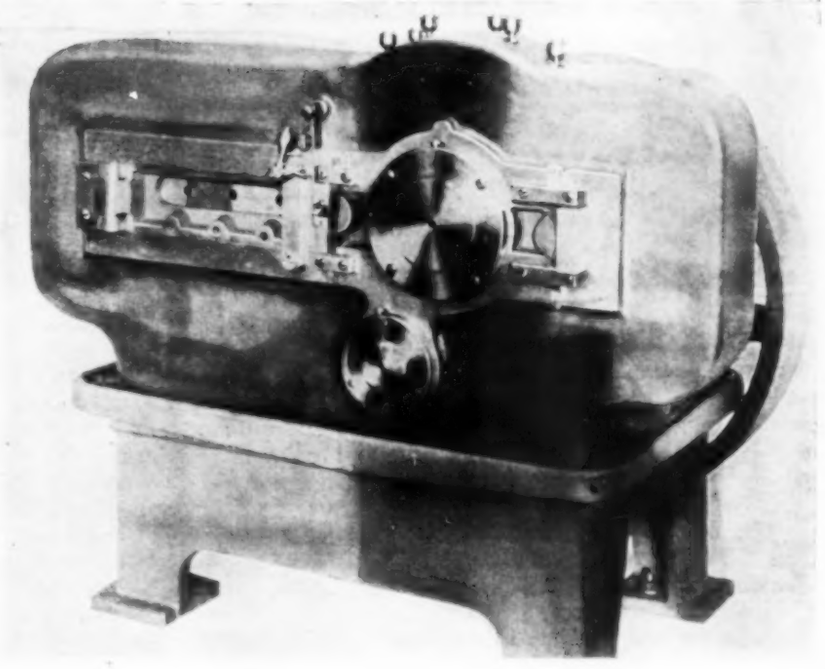
Waterbury-Farrel knuckle-joint type of hammering machine used for tube pointing and forming automobile torque tubes





Langelier No. 3 hammering machine, which produced the armor-piercing bullet core hot in one operation at 720 pieces per hour. Non-circular work can also be done

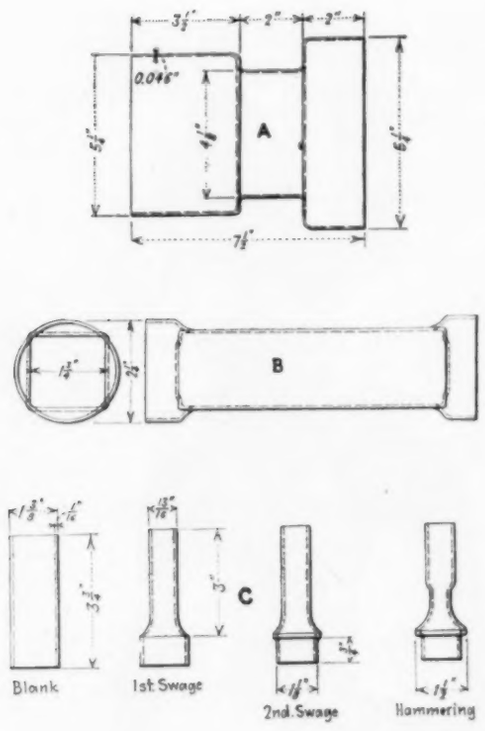
Waterbury-Farrel horizontal hammering machine of the toggle type fitted with a three-hole die

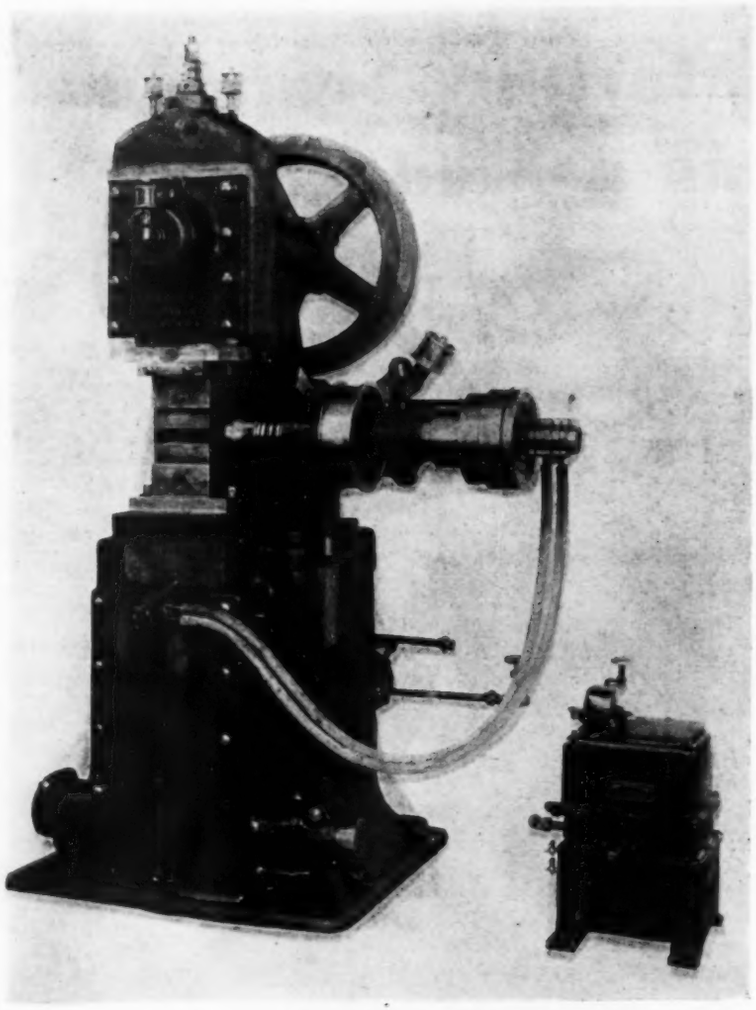


H. R. LE GRAND
Assistant Editor

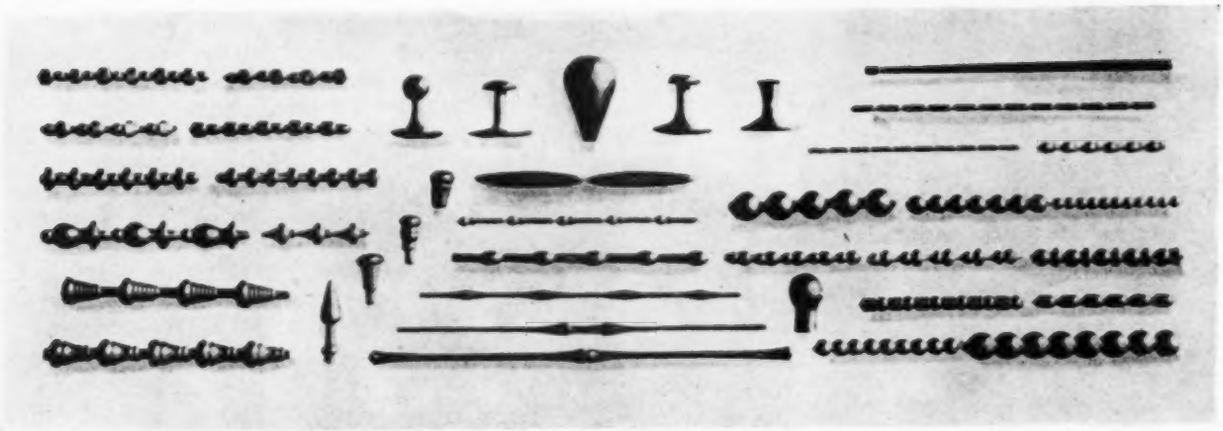
IN THE first two articles of this series we have covered the field of rotary swaging machines and their work. This article, which concludes the series, will concern itself with the reciprocating or hammering types and the variety of work for which they are adapted.

Some reciprocating swaging machines have a single die opening. Others have three or four openings into which a tube or rod may be passed successively to effect a greater reduction in section than is feasible with an ordinary single-hole die. In some machines the die blocks are





An air-operated gripping chuck, rotary attachment and hydraulic feed are applied to this Langelier No. 5 hammering machine. Parts that have been produced on this machine are: *A*—Shell of 20-gage brass, 1 per min.; *B*—Aircraft part of 20-gage duralumin tubing, first filled with sand and then squared, and *C*—Receiver part hammered in the final operation at one per min.



Typical small parts produced on the Langelier small hammering machine

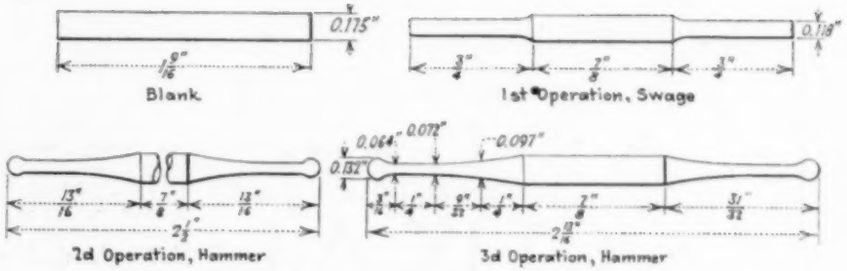
placed side by side with the plane of pressure at right angles to the axis of the work, and in others the dies lie end-to-end, and the pressure is applied in the axial plane of the work. In swaging of this class, the work usually is held, fed and rotated by hand or with tongs, no chuck being required.

Reciprocating swaging machines are of various types. Some heavy vertical tube-pointing machines employ knuckle joints located between the gate and a box frame. They deliver short power blows and operate at comparatively high speed, making 500 strokes a minute. Other machines, especially of the horizontal type, employ toggle joints and are intended primarily for use in tube and rod mills for pointing or reducing ends in preparation for drawing. They are used also for production jobs such as shaping the ends of steel rods either hot or cold, as in forming shanks on tools of various kinds. This type of machine exerts a squeezing rather than a peening action. It turns at about 200 r.p.m., but gives the piece double this number of squeezes per minute.

Necking operations by swaging are performed not only in rotary machines but also in open-die hammering

Example of Combined Rotary and Hammering Swaging Operations

Pen clip blank of "optical" wire formed by rotary swaging in the first operation and by a hammering machine with rotary attachment in the second and third operations. Flow of metal is so controlled that the ball end is upset in the final hammering operation. Thereafter, the piece is struck in a flattening die, trimmed and cut apart to form two clips



machines in which the dies do not rotate. In such machines the work is rotated if it is to have a true circular section, but pieces of non-circular and irregular section can be formed in this type of machine, as accompanying figures indicate. Some pieces are produced to best advantage by doing certain operations on a rotary and succeeding operations on a reciprocating machine.

In the hammering machine swaging is done by a pair of dies which do not rotate, although the spindle does turn. The upper die is attached to a plunger which is pressed upward by a compressed spring and is given (in one size of machine) 2,700 blows per min. by six rollers carried on the spindle. An anvil, which can be lowered to open the die, supports the lower die-block. Work is carried in a chuck on a floating spindle, which is rotated if the piece to be swaged is to have a circular swaged section, but not otherwise. Pieces of square, elliptical or other section can be swaged on this type of machine, and may even be fluted if desired. Necked and beaded parts, especially for jewelry, are made in this machine, which can be altered readily for automatic operation.

The last of three articles.

An All Arc-Welded Steadyrest—*Discussion*

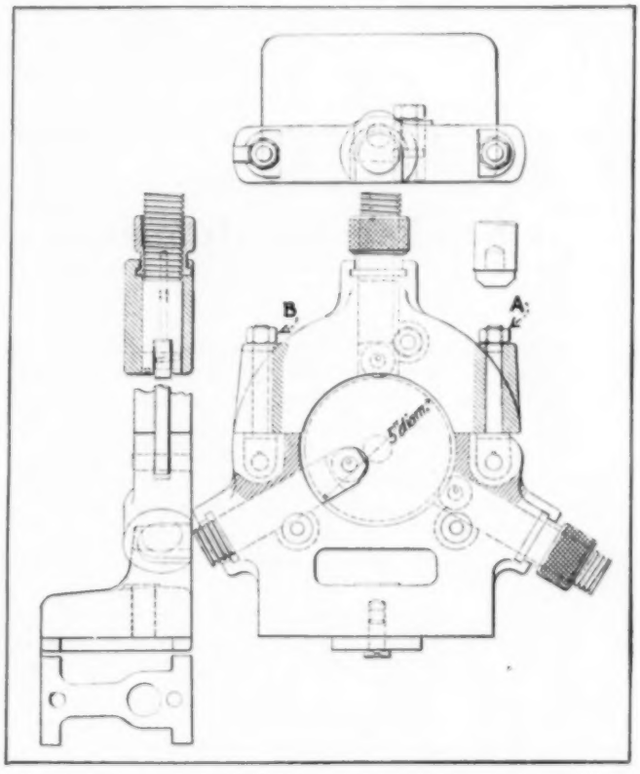
HARRY SHAW
Consulting Engineer
Heywood, Lancashire, England

WHILE perhaps admirable as an example of the welder's art, the writer is inclined to think that the welded steadyrest (*AM*—Vol. 75, page 663) is a step in the wrong direction. Instead of reducing the weight from 100 to 45 lb., I would have preferred to increase it, for I have found that weight is one of the most desirable features in a steadyrest. Even though it be quite strong so as not to deflect, a light steadyrest will vibrate, as mass is necessary to absorb vibration. Indeed, so strong is this belief in the necessity for weight that the steadyrest shown in the accompanying illustration was designed and is now described as a model for other designers.

The steadyrest was made (it is now no longer made) for work up to 5 in. in diameter and for several heights of centers. Each size was especially designed for rigidity, it not being made to suit larger lathes by putting it on "stilts," as is often the case. It is worthy of notice that no attempt has been made to reduce the weight by ribbing. In common with most steadyrests, the one under discussion has an ordinary pinned hinge. There will be a certain amount of slackness at this point —it would not be a hinge if there were not. Hence, any upward pressure from the tool (and the pressure from the tool is nearly always upward) will cause the hinged joint to open slightly.

In the steadyrest here illustrated this trouble has been overcome by designing it so that after the top half has been swung over in position, the nut *A* at the hinge is tightened and then when the nut *B* at the other side is tightened, the hinge joint will be tensioned and so cannot vibrate. Hinging in the middle of the thickness, instead of at one side, prevents the top part from canting sidewise under pressure of the cut.

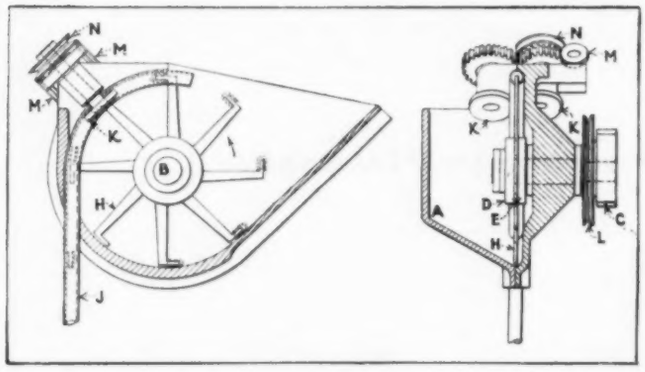
Clamping the roller bars (jaws) makes for rigidity, and the key-washers are of such size, that when the bars are clamped, the rollers have only a slight side play.



The method of adjustment of the roller bars does not necessitate the removal of metal from their middle to permit the passage of the clamping screws, as in the case of the steadyrest under discussion. This removal of metal considerably weakens the roller bars.

The pins and rollers in the steadyrest here shown are of tool steel, oil hardened, and all pins, holes, rollers, and working parts are highly polished. To remove the roller bars, they are screwed to the top, clear of the recesses.

IDEAS from PRACTICAL MEN



A Self-Feeding Hopper

JAMES R. CORNELIUS
Coventry, England

IN the illustration is shown a hopper for feeding shells that have been annealed after the first draw and are to be redrawn. It is necessary that the shells be fed with their closed ends foremost, so that they will be presented to the drawing punch in the correct position. The first draw of the shells was made as they were blanked. For the succeeding draws they were formerly fed by hand, which is a lengthy and dangerous, as well as an expensive operation. The hopper shown was evolved after several unsuccessful methods were tried.

The shells are thrown pellmell into the hopper container *A* and fall by gravity to the groove at the bottom. The central shaft *B*, driven from the press through the gear *C*, revolves carrying the plates *D* and *E* that hold the eight blades *H* in position. Each of these blades has a projection that is considerably smaller in diameter than the insides of the shells to be fed. As the blades rotate, the projections enter some of the shells and carry them around with their closed ends foremost. From the top of the hopper extends the tube *J*. It has a bore large enough in diameter to permit the shells to enter easily and is slotted over sufficient of its length to permit the blades to revolve without interference. Two other slots are machined in the tube to permit the two pliable gutta-percha wheels *K* to revolve in the position shown. These wheels are driven by a round leather belt from the grooved pulley *L*, passing over the jockey wheels *M* and around the grooved pulley *N*.

It will be seen that the inner arcs of the two wheels *K* are moving in the same direction as the ends of the blades *H* that pass between them. Because of their high speed, the wheels *K* grip the shells and carry them forward in front of one of the blades, from where they fall to the back of the preceding blade, lodging there until the blade moves out of the tube and permits them to fall down the discharge tube.

Many mechanical ejectors were tried that should have separated the shells from the blades to prevent jamming, including springs and automatic kickers that ought to have operated, but none were so efficient as the two elastic wheels driven at high speed.

Checking Locomotive Crankpins

FRANK C. HUDSON

With the increasing length of locomotive crankpins, the question of correct alignment becomes more important. Occasional misalignment has made it seem best to some railroads to finish turn all pins after they are pressed into the wheel. In any case, it is customary to check crankpins for squareness, and there are several methods for so doing. Figs. 1 and 2 show the practice of one road that has given the subject considerable thought.

The wheels are raised on V-blocks, the axle being tested with the level at *A*, Fig. 1. A collar *B*, bored to a close fit on the end of the pin and of the same outside diameter as the crankpin collar, is put on the end as shown. The level *C* shows the alignment, the wheels being turned to two positions, 90 deg. apart for this purpose.

Another method is shown in Fig. 2. A collar is also used here but in a different manner. The collar in this case, at *A*, is of large diameter. It is made with a close

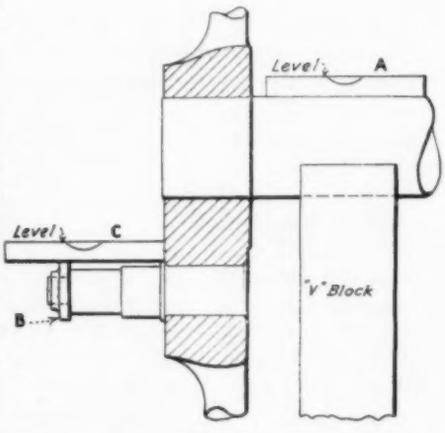


FIG. 1

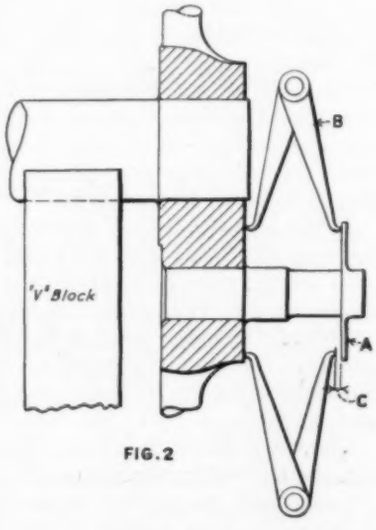


FIG. 2

fit on the pin as in Fig. 1, but has a small setscrew for locking it on the pin. The locking should be done lightly to avoid any distortion.

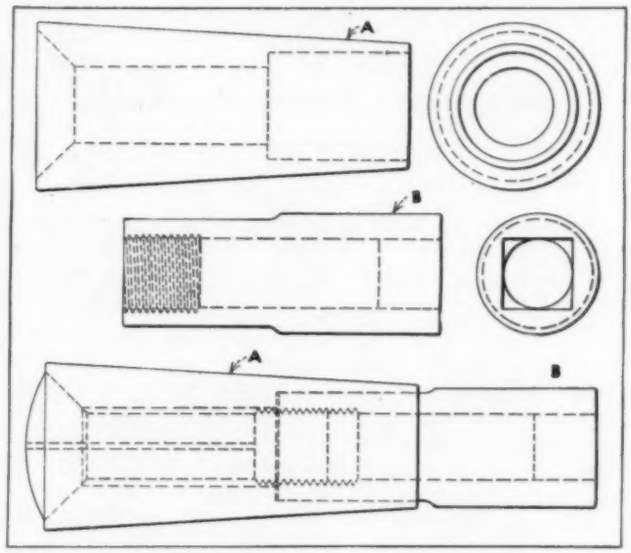
Squareness of the pin is checked by measuring the distance between the flanged collar and the machined face of the wheel with a caliper, as *B*. If the distance is the same all around the pin is square. Any variation, as at *C*, shows out of squareness, and where. The amount of error is one-half of *C*.

An Adapter for Spring Collets

ARTHUR R. MYERS
North Electric Company

Collets belonging to the bench lathe can be utilized in the dividing head of the universal milling machine by means of the adapter shown in the sketch.

The part *A* is fitted to the taper hole in the dividing



head and is bored at one end to receive a collet, while the opposite end is bored for the short draw-in rod *B*. One end of the draw-in rod is threaded to fit the threads on the inner end of the collet, while at the opposite end is broached a square hole for a square-ended wrench.

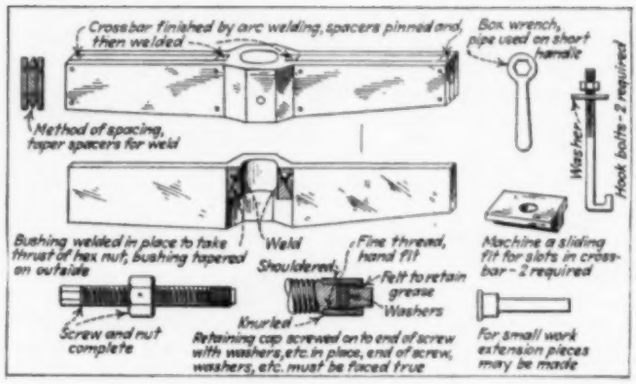
The whole assembly is so short that the draw-in rod does not project from the rear end of the dividing head, consequently it can not interfere with any part of the machine when the head is set at an angle.

A Wheel Puller Fabricated by Welding

W. S. GALLMAN

All shops should have at least one or two good wheel pullers designed for efficient service, yet as light as possible. I herewith submit a design for such a puller, in which the crossbar is of plate steel and is fabricated by welding. The screw has a buttressed thread for strength and is provided with an easily-attached extension that will not mar the centers in shafts. The nut is removable and can be easily replaced when worn. The hexagon hole in the crossbar will admit a standard nut.

Originally, I intended to put a ball bearing between


Crossbar finished by arc welding, spacers pinned and then welded
Box wrench, pipe used on short handle
Method of spacing, taper spacers for weld
Washer
Hook bolts - 2 required
Bushing welded in place to take thrust of hex nut, bushing tapered on outside
Weld
Shouldered
Fine thread, hand fit
Machine a sliding fit for slots in crossbar - 2 required
Felt to retain grease
Washers
Knurled
Screw and nut complete
Retaining cap screwed on to end of screw with washers, etc. in place, end of screw, washers, etc. must be faced true
For small work extension pieces may be made

the end of the screw and the extension, but our master mechanic suggested the use of washers having radial grooves as being better. No dimensions of the puller are given, but it should be designed to do the work. The crossbar of this particular puller is 24 in. long and is made from ½-in. plate, the spacing between the plates being great enough to admit ⅞-in. bolts.

Making Machines Portable

L. B. MURDOCK

To take advantage of the benefits to be derived from straight-line production, we have had for some time a number of our drill presses and punch presses, as well as some of our shears, mounted on wheel bases so they could be moved to any desired location in the production line.

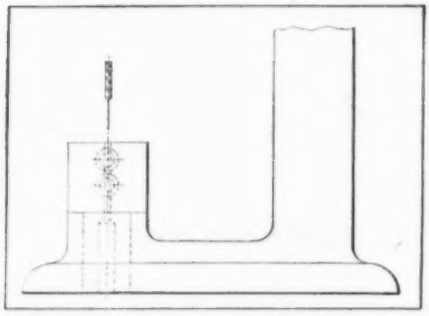
The bases are made of structural steel to fit each individual machine. Each one is equipped with casters at the front, while at the rear are feet. In the center of the rear is a pair of lever-operated casters, so arranged that dropping the lever brings the casters to the floor and raises the feet, thus supporting the base entirely on wheels. These casters and the lever are attached to a pin that swivels in a bracket secured to the crosspiece of the frame that supports the motor. Thus when the base is entirely supported on wheels, it can be moved and steered in any direction by the lever, much the same as a four-wheeled warehouse truck. When the new location is reached, the lever is returned to the vertical position, lifting the casters from the floor and allowing the rear end of the base to rest upon its feet. A simple adaptation of the device is shown

in the illustration, having a drill press mounted thereon. For mounting a wide, heavy shear, we used a base having two sets of casters and two levers and equipped with hydraulic checks to ease the lowering pressure on the levers. The same practice may be applied to other types of machine by making bases to suit.

A Jig for Drilling Pins—*Discussion*

EUGENE H. KOENIG

Having read the article by Robert S. Alexander, under the title given above (*AM*—Vol. 75, page 572), I want to suggest that the jig could have been used more efficiently in a small bench drill where the round shank could be inserted in the hole for the table, as indicated in the sketch herewith. How are the chips going to get out of Mr. Alexander's jig? The clearance hole for the drill should be drilled clear through the shank and enlarged from the back, as indicated. Also, I do not think it is advisable to omit devices for locking and ejecting the work. I suppose Mr. Alexander has omitted these features for the sake of simplicity.



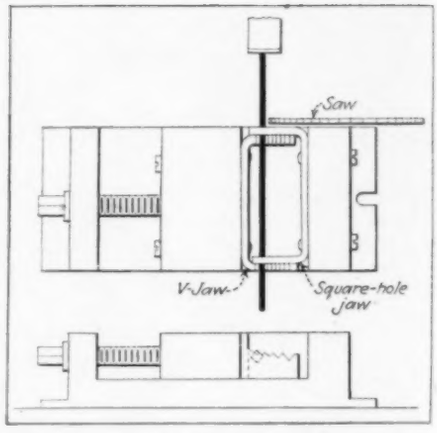
A Vise That is Tightened and Loosened by the Same Movement

ARTHUR KENDALL
Hamilton, Ontario, Canada

Where work is held in a machine vise, the opening and closing of the vise sometimes takes longer than does the cutting operation.

We have an old hand milling machine, which we rigged up for sawing up brass bars, and lately we made a pair of special vise jaws for holding the work. The jaws are made of $\frac{1}{8}$-in. flat steel, bent over as shown in the illustration, and are attached to the regular jaws by screws. One jaw has a square hole large enough to take the largest bar to be cut. The other jaw has a series of 90-deg. V-notches of various sizes cut in it. When the square hole is brought into alignment with the V-notches, a series of square openings is formed to accommodate different sizes of stock.

It will be seen that when a bar is in place in the vise, it can be gripped by moving the lever in either direction. The operator keeps one hand on the bar, and after one piece has been cut off, he loosens the vise grip by moving the lever, say to the left, and pushes the bar against the stop. Moving the lever still farther to the left tightens the grip on the bar. To loosen the grip on the bar, the operator moves the lever to the right. After pushing the bar against the stop, he tightens the grip by moving the lever still farther to the right. With one hand on the lever and the other on the bar, the operator can loosen the grip, push the bar against the stop, and tighten the grip while continuously moving the lever in one direction.



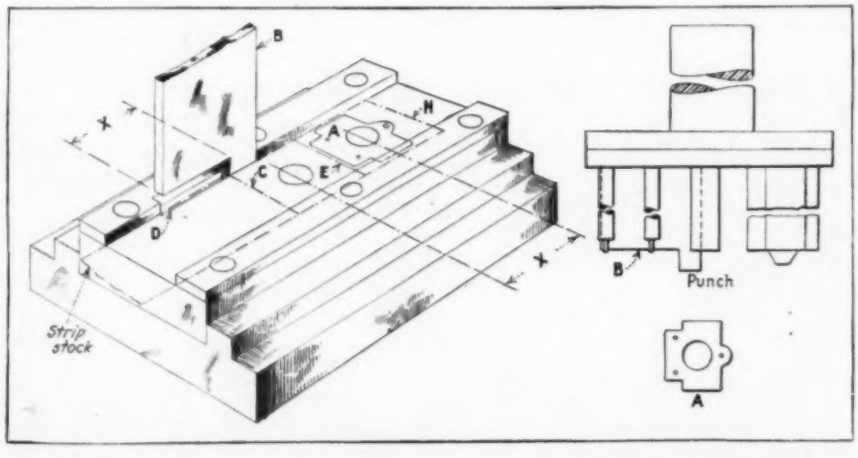
Inexpensive Progressive Tools
Discussion

HENRY W. BOEHLY

The progressive tools described by Charles H. Willey in an article under the title given above (*AM*—Vol. 75, page 426) invite friendly criticism. While the idea is practical if the tools are properly designed, the tools shown by Mr. Willey are not complete, since there is no stop such as is necessary in progressive tools. Because of the absence of the stop, the tools are not foolproof and their production depends largely upon the skill of the operator.

In the accompanying illustration is shown a set of tools that I designed several years ago, and which have been successfully operated. The product *A* has three small holes and one large hole pierced in it. These holes must be accurately located in relation to the outside of the blank. One complete piece was produced at each stroke of the press.

In operation, the strip stock is fed against the stop *B*, which is attached to the punch-holder, as is indicated by the dot-dash line *C*. At this position, the three small holes are pierced and, simultaneously, a small strip of metal is sheared from the side of the stock, as shown



by the line *D*, thus permitting the stock to be advanced until the corner *D* banks against the stop *B*. The end of the stock has now been advanced to the dot-dash line *E*. At the stage, the large hole is pierced, while the piercing of the three small holes is repeated. The stock is now advanced another distance *X*. At this stage, the complete part is blanked.

The strip is then advanced as far as is indicated by the dot-dash line *H*, after which, a complete part will be produced at each stroke of the press. The press may now be run continuously. It is necessary only to feed the stock against the stop *B* at each stroke of the press for satisfactory results. No special skill is required on the part of the operator, as would be the case in the tools described by Mr. Willey.

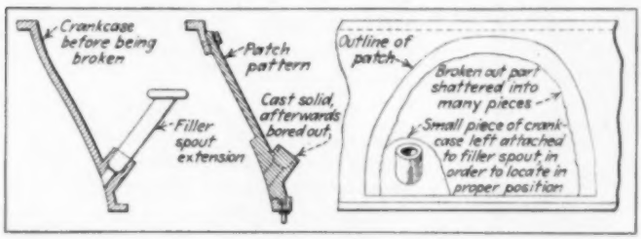
The strip stock is about $\frac{5}{16}$ in. wider than would ordinarily be required, because of the small strip that is sheared from the side of each piece. The additional cost of the wider strip is more than compensated for by the speed and efficiency of the tools. The tools are shown with the stripper removed so that the details may be seen more clearly.

A Plastic Pattern for a Crankcase Patch

H. M. PRICE

Recently, we had to repair the broken crankcase of a Buick automobile. A piece, of which the oil-filling spout was an integral part, was broken out, the break extending from within $\frac{3}{4}$ in. of the top, clear down to the bottom flange.

To make a pattern for the patch, a piece of tin was fitted to the inside of the crankcase under the hole and


Crankcase before being broken
Patch pattern
Filler spout extension
Cast solid, afterwards bored out
Outline of patch
Broken out part shattered into many pieces
Small piece of crankcase left attached to filler spout in order to locate in proper position

was blocked in with wooden blocks. The broken filler spout was then blocked in position, and the cavity was filled flush with the outside of the case with water putty. When the putty was hard, both it and the outside of the crankcase were coated with a mixture of graphite and oil over an area as large as was required for the patch.

Then a water-putty outer patch was built up and worked in tight around the filler spout. Some anchor screws had been screwed into the spout to help hold the putty. After the putty had hardened (about five hours) the outer patch was lifted off, and with very little dressing, was ready to be used as a pattern for a gray-iron casting. Of course, the broken part of the crankcase attached to the filler spout was fast to the inside of the patch pattern, but the molder had no difficulty in stopping it off in the sand.

After getting the casting from the foundry, it was a simple matter to bore a hole in the blank filler spout for the extension, and to drill holes for the holding screws. Little fitting was required to bring the patch to a good bearing. The patch was attached to the case with $\frac{1}{4}$-in. capscrews. Three $\frac{5}{16}$-in. shoulder studs were screwed into the flange of the patch through the original holes in the flange of the crankcase used for holding up the bottom pan, the holes in the pan being enlarged so that the shoulders of the studs would pass through. Of course, the threads in the holes of the crankcase flange were drilled out so the studs would clamp the flange of the patch tightly. Litharge and glycerine were used to make tight joints on the patch, capscrews, and studs.

SEEN AND HEARD

JOHN R. GODFREY

Free Service Again

Among the many little services that railroads render to shippers gratis is the occasional use of a locomotive crane for loading and unloading heavy freight, such as structural steel, at way stations. The wrecking crews of many roads turn their hand to a job like this when the shapper has no facilities of his own. Evidently the I.C.C. frowns on the practice as it recently had the Pennsylvania Railroad indicted at Bradford, Pa., for performing this service without tariff authority. Tariffs subsequently filed by the Pennsylvania were suspended by the I.C.C. this week, pending an investigation that will serve to put all roads on notice that, according to the I.C.C., this is just one of those things that, however kindly the intent, just shouldn't be done in the best railroad circles.

Single-Coat Finishes

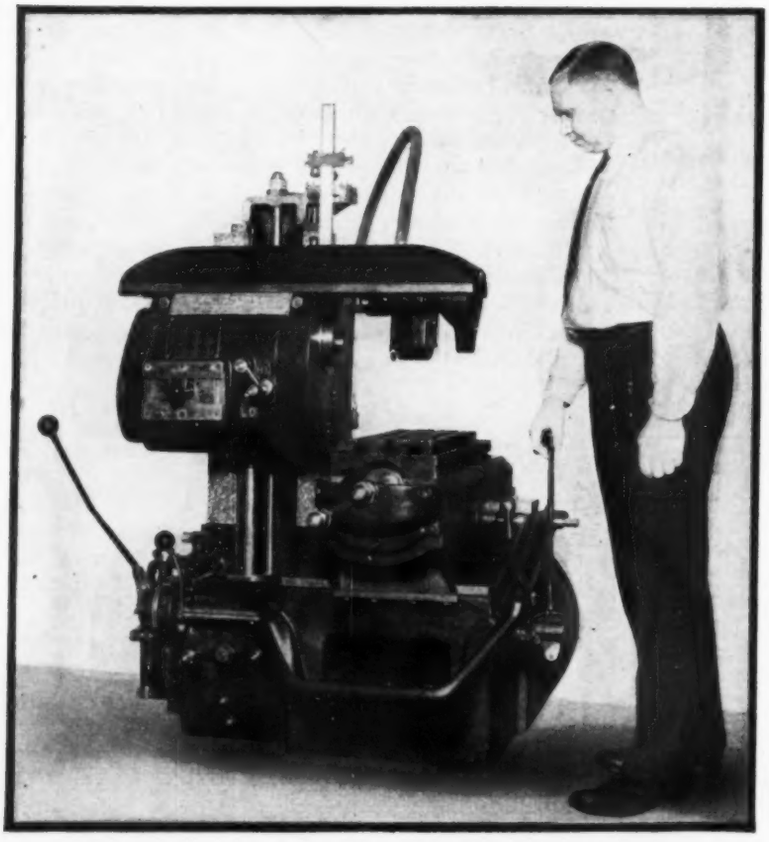
Manufacturers of many metal products, including makers of sheet metal furniture, kitchenware, and the like, are today using large quantities of white and light colored baking enamels of the newer quick-drying type containing what are termed rezyl gums. Many of these finishes, even including white, give excellent covering with only a single coat. The latter is sprayed on and then baked for about an hour, as a rule, at a temperature of about 200 deg. F. The resultant finish has a high luster, and probably is the most enduring single-coat finish developed to date, with the possible exception of black japan which usually require baking at much higher temperature.

If the pigment is properly selected, the drying involves little if any discoloration, even in the lighter colors, and the finished job is equal in appearance, and probably in durability, to many two- and three-coat jobs with older types of finish. Titanium dioxide is the pigment employed to avoid discoloration in white enamels of this type. Similar enamels are available also for ordinary air drying in about four hours. Consequently baking ovens are not essential, although it is probable that baking improves durability.

It is not expected that these single-coat enamels will displace multiple-coat finishes in higher grades of work, but there is no doubt whatever that they do an excellent job where a single coat is all the cost of finishing will permit. Similar finishes are also available for two or more coats and may displace other finishes for higher grade work.

SHOP EQUIPMENT NEWS

"Kemp-S-Mill" Hydraulically Actuated Production Milling Machine



Built throughout for production work and embodying hydraulic feeds for the headstock and table, nevertheless this "Kemp-S-Mill" has the flexibility in handling of a hand miller

A milling machine combining flexibility in operation and a range of speeds to cover a wide variety of work in either small or large production runs is being introduced by the Kempsmith Manufacturing Co., Milwaukee, Wis. Equipped with a hydraulic circuit, the "Kemp-S-Mill" differs from standard production millers, in that, while the control of the feed rate may be predetermined and automatically actuated, the feed rate can be changed entirely at the will of the operator by keeping his hand at all times on a centralized control lever, dually applied. Having a working surface of the table of 26x8 in. and a longitudinal travel of 14 in., the machine is designed for processing the average run of small parts as well as shuttle milling of two pieces not exceeding in size a 6-in. cube. Range of cutter speeds in excess of conventional practice is provided to obtain the proper peripheral speeds for small-diameter cemented-carbide cutters.

Another innovation is that by means of a selector lever either the headstock or table can be fed hydraulically, one at a time, or both can be held in a fixed position with the spindle rotating. Hand cross adjustment is used for the saddle. Direction and speed of movement of either the headstock or table is governed by the direction and amount of movement of the control lever. Brought back to the neutral position, this lever stops the spindle. Through a side movement of this same lever the hydraulic spindle drive clutch is disengaged without interrupting the traverse of either unit. Spindle stopping or starting is thus synchronized with the table or headstock movement and reduces wear on the driving parts, as well as assuring safety to the operator.

The Hydraulic Circuit

The hydraulic circuit facilitates feeding the headstock or the table in either direction, and if desired holding either against a positive stop for an indefinite length of time. Plunge cut milling is possible, therefore, in both directions of the table and headstock. To the flexibility of hand milling is added full power necessary for fast cutting on production schedules. Fast or slow feeding can be had to suit light or heavy cuts, or to jump gaps.

Two types of headstocks are available as standard equipment. One is supplied with two series of selective-type speed changes to the spindle, the first giving eighteen changes of speed in geometric progression ranging from 32 to 1,200 r.p.m.; the second, by means of a pair of herringbone pick-off gears, affording nine additional changes ranging from 300 to 1,800 r.p.m. All changes are made through a two-lever control on the headstock, conveniently located. For special high-production jobs, it is possible to provide a headstock having all speed changes made through pick-off gears, with a spindle speed range from 39 to 1,860 r.p.m. Four sets of gears providing sixteen changes in speeds are supplied as standard equipment with this type of headstock.

Referring to the illustrations, it will be noted that the saddle rests on two ways at different elevations. The lower way is merely an elevation support, while the other serves also as a guide for the cross adjustment.

The purpose of this design is to provide a machine with the rigidity of a bed type in so far as overhanging of the table is concerned, and at the same time to avoid the necessity of an overhanging spindle. This construction, besides offering resistance to possible chatter, also provides a mounting for a drum, which replaces both the table and saddle for continuous milling. The drum will accommodate a fixture 24 in. in diameter.

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Specifications

Longitudinal table feed, 14 in.
Vertical feed to headstock, 12 in.
Cross adjustment to saddle, 6 in.
Work surface of table, 26x8 in.
T-slots in table, three, ¼ in.
Minimum height from top of the table to center of spindle, 3 in.
Maximum height from top of the table to center of spindle, 15 in.
Feed range, table and headstock, infinite number ranging approximately 0 to 40 in. per min. in both directions.
Variable rate accelerating-type rapid power traverse in both directions to either the table or headstock, 0 to 220 in. per min.
Spindle speeds selective type geometrical progression: first series, eighteen, 32, 47, 54, 66, 79, 92, 119, 135, 190, 202, 297, 339, 417, 499, 591, 701, 854, 1200 r.p.m.; second or high series, nine, 311, 457, 522, 632, 768, 915, 1080, 1315, 1848 r.p.m.
Greatest diameter of cutter swing under overarm, 10 in.
Height of table from floor, 30 in.
Floor space required, 59½x39 in.
Inclosed direct motor drive, motor recommended optional 3 to 5 hp., 1,800 r.p.m. constant-speed, direct or alternating current.
Cutter coolant pump capacity, 5 gal.
Weight, 3,000 lb.

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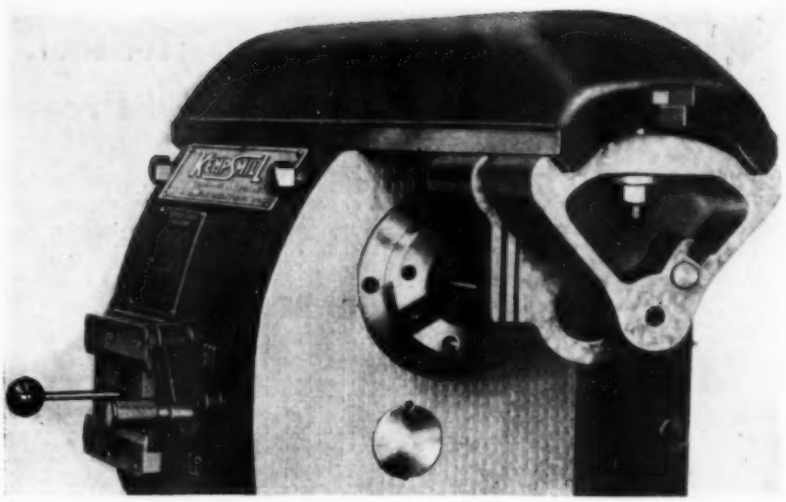
The hydraulic table feed cylinder has a press fit in the table casting and hence becomes an integral part of the table. This construction permits using a fixed piston rod anchored at both ends in the saddle and held taut to increase its rigidity. The deep center section thus given the table resists distortion owing to clamping of fixtures on the surface. To conform with the average conveyor height, the table top is 30 in. from the floor.



Triple-crescent overarm construction is used to resist arbor distortion. A National Standard spindle nose is employed

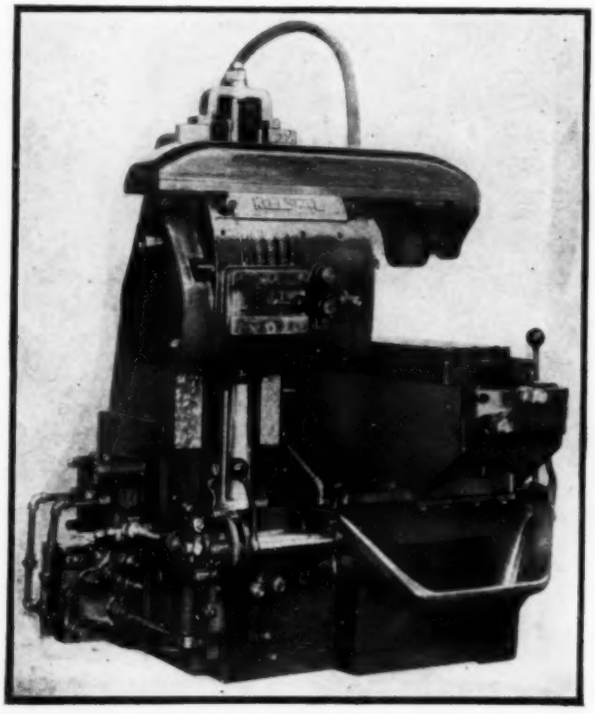
The headstock is a one-piece semi-steel casting and like the table has the feed cylinder inclosed within it. It slides up and down on the headstock column, which is cast in one piece with the semi-steel base. In the base are inclosed the hydraulic circuit and motor.

In form the overarm attached to the headstock represents a triple crescent, offering considerable resistance to arbor distortion, and offering resistance to deflection at the point nearest to the horizontal line of applied torque. Clearance is allowed for a 10-in. cutter. Two types of arbor supports accommodate the National Standard Style A and B arbors. Convenient means for removing and replacing arbor supports is provided for.

Anti-friction bearings are used to support the spindle, which has a National Standard spindle nose, and are used as well throughout the machine. Just back of the front spindle bearing is a large gear for the low-speed drive and immediately behind this is a herringbone gear for higher speeds. The high-series spindle speeds are obtained by a pair of herringbone gears at the rear of the spindle.

Drive to the headstock is through a spline shaft running at constant speed and driven from the main shaft, which is reversible through a pair of bevel gears and reversing clutch. All shafts are alloy steel, splined and heat-treated, and the gears are also of heat-treated alloy steel.

This same drive shaft is directly connected to the hydraulic pump and contains the hydraulically controlled clutch. By connecting the hydraulic clutch directly into the feed circuit, the more resistance built up in the system owing to work resistance, the greater is the gripping power developed in the clutch. Another innovation in the feed circuit is that the table ways are automatically lubricated by means of fine passages designed to eliminate air from the hydraulic system at the high points. Gears in the headstock are cascade lubricated, but lubrication of the headstock ways is by a wick siphon system. To provide for this loss of fluid, oil is replenished to the main pump by oil in an elevated tank, which in turn is supplied by a small auxiliary pump. A coolant pump, if desired, is installed within the column base.



A deep center section for the table resists distortion. An hydraulic clutch in the feed circuit develops gripping power in proportion to the work resistance

Henry & Wright 350-Ton, All-Steel, Double-Crank, Straight-Sided Press

The 350-ton all-steel, double-crank, straight-sided press illustrated is representative of the recently added line of double-crank steel presses of welded construction built by The Henry & Wright Mfg. Co., Hartford, Conn. This press is double-geared with twin-gear drive. It is of the shrunk-in tie-rod type, with the bed, uprights, crown, slide and twin gears made of welded steel. Welded steel construction reduced deflection in the frame members by 60 per cent of the amount usually found.

The heat-treated crankshaft is made from an alloy steel forging and is mounted in square-backed removable bushings. The intermediate and drive shafts are equipped with Timken bearings located in cartridge-type mountings. Major castings, such as the connections and flywheel, are made from high-test alloy iron.

The machine has direct-connected motor drive by a 20-hp. ball-bearing motor mounted on the left-hand rear bracket. The slide is arranged for motor adjustment by means of a 5-hp. motor. An electrically operated friction clutch of multiple plate design is employed, the controls being so arranged that four methods of operation are available. The master control box is located at a convenient height on the right-hand upright and contains two pushbuttons. One is the emergency stop button, and the other is placed in serie with suitable resistances and is used to jog or inch the slide when setting dies. A third button is located in the master control box and can be turned to either of two positions. One position is for single stroke operation, and the other allows the press to operate continuously.

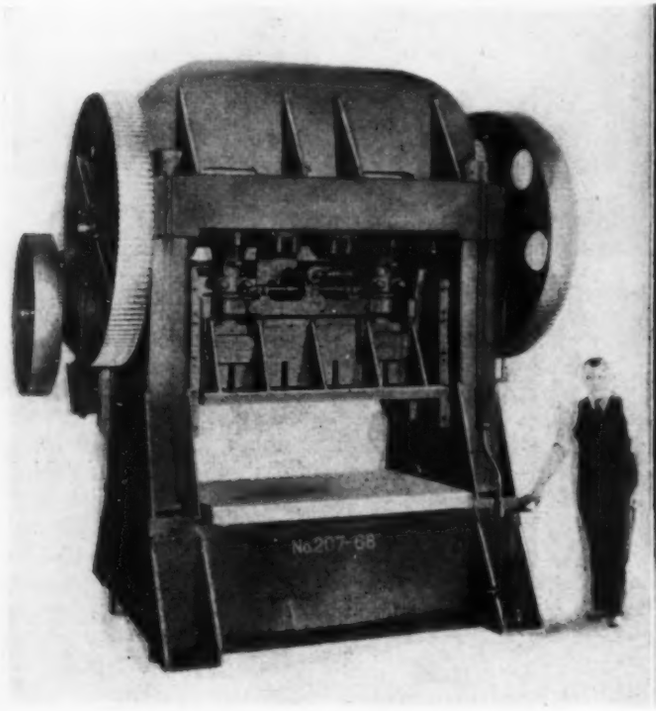
Ordinarily, pushbuttons are mounted on the slide for the operator to depress in order to start the machine after the control button has been turned to either the single stroke or continuous operating location. On the press shown, however, a treadle operating a pushbutton located at the front of the machine was provided. This press was furnished to an electrical refrigerator manufacturer, and one or two helpers are required at the rear to remove the finished work. The rear view shows four pushbuttons located on the knockout bar, these buttons being in series with the treadle button so that they must be depressed before the clutch can be engaged. This assures complete safety to the operators at all times. In the event that only one helper is required at the rear, two of the pushbuttons may be locked in the circuit.

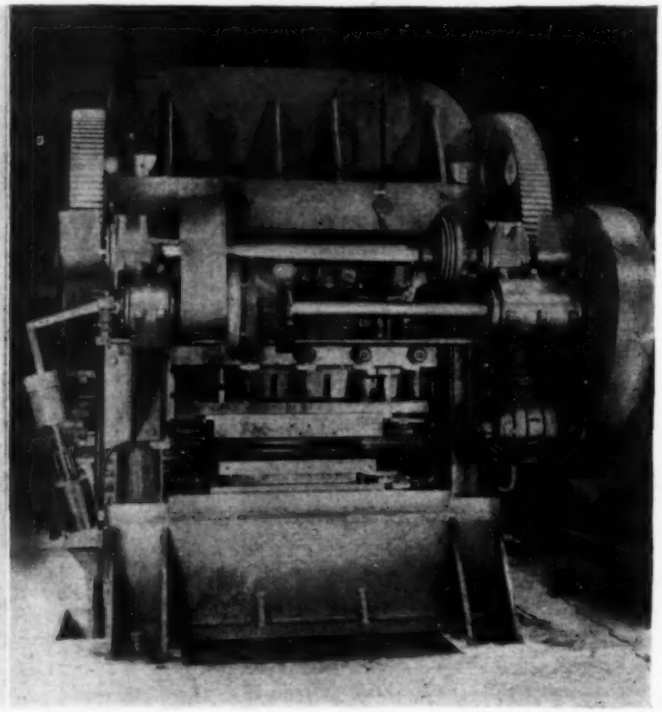
Major specifications of this press are: Capacity near bottom of stroke, 350 tons; distance between uprights, 68 in.; stroke, 8 in.; shut height, bed to slide, 18 in.; adjustment of slide, 4 in.; area of bolster, 47x66 in.; opening in bed, 34x50 in.; thickness of bolster, 4 in.; number of strokes per min., 17; approximate net weight, 49,000 lb.

Foster Speed Calculator

A machine speed calculator for use in the shop and also in time study and engineering departments has been developed by the Foster Machine Co., Elkhart, Ind. This calculator can be used in conjunction with almost any type of machine for selecting the

proper spindle speeds. The surface feet plate lists the recommended cutting speeds for different materials. After the surface feet have been determined, the spindle speeds for the different diameters are quickly selected by turning the drum until the diameter of the work as listed on the left of the drum is just above the surface feet plate. The correct spindle speed will appear directly above the





surface feet selected. Spindle speeds for milling cutters and drills are selected in like manner by using the diameter of the cutters and drills in place of the diameter of the work.

Oliver Model P-4 Die Making Machine

Redesign of its Model P-4 pedestal-type die making machine has resulted in several improvements, according to the Oliver Instrument Co., Adrian, Mich. The Model P-4, which has capacity for sawing tool steels 2 in. thick, is now fitted with a screw-feed

sawing attachment to minimize saw breakage. In addition, hold-down fingers are now attached directly to the overarm, so that the working surface of the table is entirely clear. The overarm may be swung away from the file to remove the die for inspection, and it is not necessary to remove the file or to loosen it in the lower clamp in order to inspect the die.

The machine shown is in reality a duplex type, since it has special arrangements for holding light or heavy files and saws. Clamps attached directly to the reciprocating rams hold heavy parallel files. These clamps also carry other adjustable clamps for smaller tools.

These clamps are brought forward to simplify the insertion of files and saws, and they also can be adjusted vertically to permit the use of the shortest file or saw commensurate with the thickness of the work. The upper ram is actuated through a bell-crank and two coil springs which provide uniform tension on the saw. The table is supported on two brackets and tilts in four directions, while the working surface is ground. A magazine attached to the under side of the pan contains saw coils of various lengths. If desired, this machine can be furnished with a variable stroke and mechanical feed.

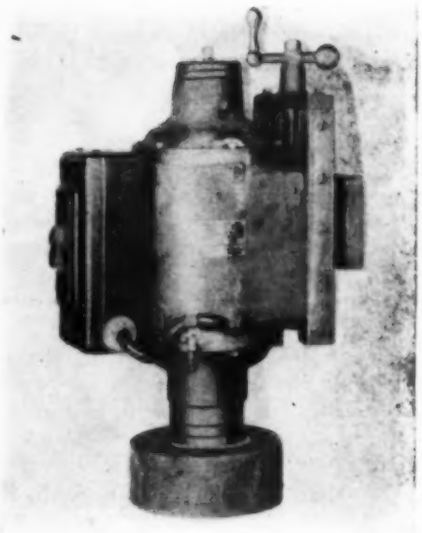
The Model P-4 can be furnished for motor belt drive or belt drive. As shown, it is arranged for floor mounting and is equipped with a motor belt drive permitting five speeds through the V-belts. A ½-hp. motor furnishes power. The weight is approximately 400 lb.

Oxweld Cromaloy Flux

Cromaloy flux, one of the line of Oxweld welding fluxes distributed by The Linde Air Products Co., 30 E. 42nd St., New York, N. Y., has been developed especially for use in welding the chromium-containing alloys more generally known as stainless steels or rustless irons. Ordinary fluxes are not suitable for this purpose because they will not dissolve the infusible oxides, consisting chiefly of chromium oxide. A satisfactory flux for use in welding these alloys must be sufficiently fireproof to protect the molten metal and hot metal adjacent to the weld from oxidation, and at the same time to dissolve the refractory chromium oxide quickly. Cromaloy flux is designed to meet these two conditions.

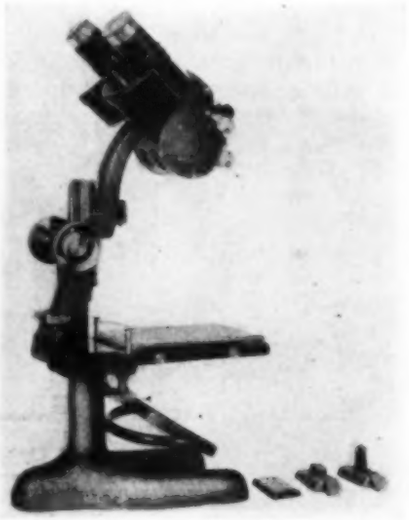
"Standard" Vertical Grinder

A vertical grinder for attachment to a planer or other machine tool has been developed by The Standard Electrical Tool Co., 1938-46 W. Eighth St., Cincinnati, Ohio. It is especially adapted for grinding dies or for surface grinding on a planer or boring mill. A pad is provided on the vertical feed for attaching the grinder to the machine. A special G.E., 3600-r.p.m. motor is used, and is operated by a switch mounted on the housing. S K F ball bearings are employed throughout, a special bearing being provided to take care of the end thrust. The machine is equipped with a cup wheel 7 in. diameter, 1¼-in. wall. Sizes from 3 to 10 hp. are made. The weight of the 4-hp. grinder illustrated above is 155 lb.



Bausch & Lomb Type BKT Microscope

A microscope particularly adapted for the study of large or bulky specimens, examination of cutting tools and machinery for evidence of wear, surfaces for cracks and blow holes, and other forms of routine microscopic inspection has been announced by the Bausch & Lomb Optical Company, Rochester, N. Y. This Type BKT microscope is similar to other wide-field binocular microscopes manufactured by the company, but is mounted on a laboratory stand with

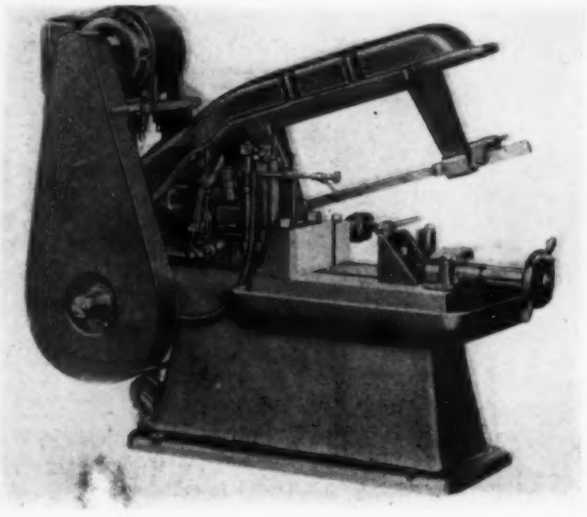


substage mirror, which greatly broadens the range of its application. The stage is of glass, and thus either opaque or transparent specimens can be observed. The microscope is removable from the base, and can be placed on objects too large for the stage to accommodate. The binocular eyepieces are inclined at an eye-level angle to give greater ease in operation. Five pairs of objectives are interchangeable in the revolvable drum nosepiece to provide stereoscopic vision and to give a range of magnifications from 0.7 to 87 times.

Peerless No. 10 High-Speed Metal Sawing Machine

A No. 10 high-speed metal sawing machine of 10x10 in. capacity has been announced by the Peerless Machine Co., 1615 Racine St., Racine, Wis. Two speeds are standard, one of 90 strokes per min. for tool steels, and the other of 140 strokes per min. for machine steels. A motor stand is built integral with the machine, but the arrangement is such that the user is able to operate the machine from a lineshaft by belt drive or by a motor. V-belt drive is used for the motor equipment.

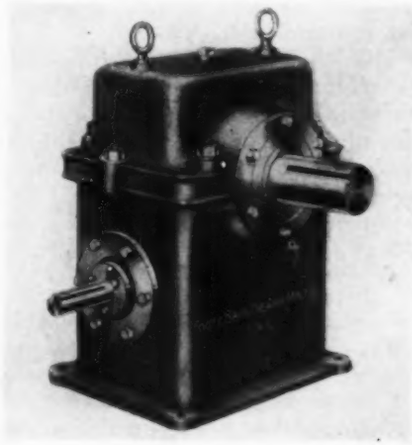
Either a full swivel vise or a plain straight cutoff arrangement is provided for. Feed pressure changes are made by a graduated scale arrangement operated by a dial. This gives the amount in pounds of feed pressure being applied to the saw blade. A clutch arrangement is provided within the drive pulley so that when the cutting operation is concluded, the clutch is automatically released and the saw frame carrying the saw blade rises up and away from the work and then stops. A positive automatic lift of the saw blade on the non-cutting stroke is provided, so that regardless of how much feed pressure is being used there is no drag as the blade rises from the work. A pump for compound is located at the rear.



Feed pressure on the saw blade can be changed readily. Strokes are 90 and 140 per min.

"Hygrade" Size 5-HG Worm Gear Speed Reducer

The Foote Bros. Gear & Machine Co., 215 N. Curtis St., Chicago, Ill., has added to its line of "Hygrade" worm gear speed reducers the Size 5-HG, which fills the gap between Sizes 4-HG and 6-HG. In many cases the last two units could not be used economically. Ratios of the new size vary from 3.5:1 to 3000:1. The reducer, like other sizes in the line, is built in five types—HGS, having the worm at the bottom; HGT, with the worm on the top; HGV, with the worm gear shaft vertical; HGX, consisting of a worm reducer with helical attachment, and HGD, having a double worm and worm gear reduction.



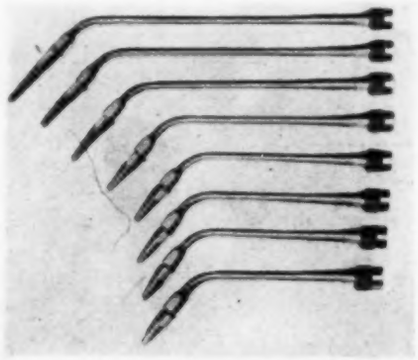
All shafts in these reducers are of heat-treated alloy steel. SKF thrust and radial ball bearings support the worm shaft; Timken tapered roller bearings the worm gear shaft. Bearings permit a hung load of 1,750 lb. on the slow-speed shaft of the vertical type. Maximum torque of the slow-speed shaft is 1,375-in. lb. A special cast-iron bedplate designed for each type of reducer can be furnished for mounting the reducer and motor in correct alignment.

"Alumaweld" Solder

A solder for aluminum, cast iron, brass, bronze, copper and other metals has been developed by the Alumaweld Co., Div. of Allied Research Laboratories, Inc., 710 E. Broadway, Glendale, Calif. In repairing water pipes and fittings, the solder is claimed to hold pressures up to 1,000 lb. In repairing steam pipes and fittings it will hold up to 500 lb. steam pressure. In addition, the product can be machined, will take a polish, and the surface can be plated. It is said that no electrolytic action takes place between Alumaweld and any metal to which it may be applied. The solder can be applied with a blow torch to large cracks or by means of a soldering iron where the breaks are very small.

"Oxweld" Welding Heads

A series of welding heads with detachable tips has been introduced by The Linde Air Products Co., 30 E. 42d St., New York, N. Y., for use with the "Oxweld" Type W-17 welding blowpipe. These welding heads will supplement the one-piece style heads for this blowpipe, so that the user will have a choice of two types.



They are especially useful in production operations. The tip produces the same type of flame as that produced by the one-piece welding head. Sizes Nos. 6 to 13 inclusive are available. Removal or replacement of the weld-in tip is facilitated by means of the threaded connection.

Hammond Straight-Line Automatic Polishing and Buffing Machine

Any type of work not requiring a rotating work fixture can be processed on the straight-line automatic polishing and buffing machine developed by Hammond Machinery Builders, Inc., Kalamazoo, Mich. This machine is not limited in width, number of wheels or length. As shown, the machine is arranged for polishing and buffing the top and inside edge of the hinge on a ventilator door used on the hoods of modern automobiles. The size of this door is 12 in. long by 4 in. wide. Production is 900 finished pieces per hour.

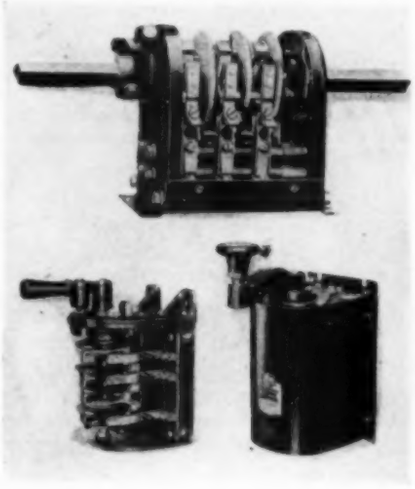
One of the features of this machine responsible for the finish and the speed secured is the caterpillar-type of conveyor unit. The cast-iron platens, which form the conveyor, are machined true and are so heavy that any type of fixture or adapter may be attached. This construction permits side as well as top polishing. Platens are mounted on hardened rollers, chain driven, and run on continuous rails. If desired, the speed may be changed through the use of a variable-speed multi V-belt drive.

The polishing and buffing heads, of which there are twelve on this machine, are complete motor-driven units. Drive is furnished by V-belts, and the speed can be varied either through various sheave diameters or by means of the Hammond variable-speed pulley, which permits obtaining any speed 50 per cent above the low.

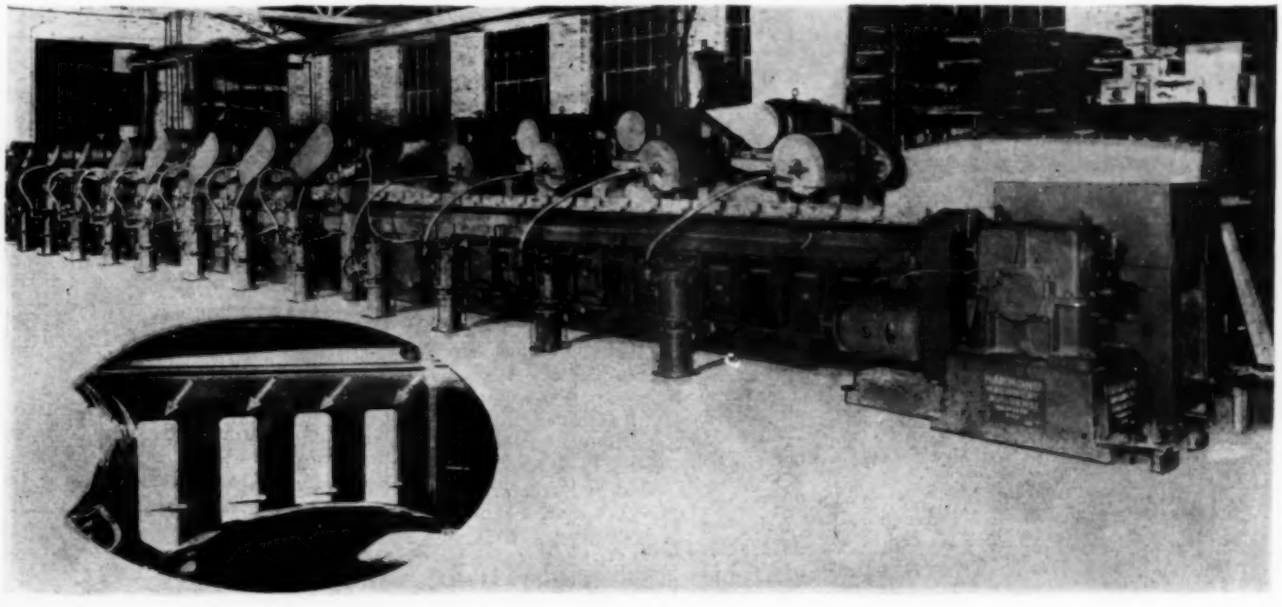
The spindles have self-contained oscillation, which may be thrown in or out by a lever on the outside of the housing. Each head is mounted on universal knuckles, and is supported by a vertical column, which can be raised or lowered. When equipped with a tilting adjustment, it is possible to move the wheel from a vertical to a horizontal position. Both spring and weight balance controls provide for any predetermined pressure for polishing and buffing. Automatic composition feeders, recognizable as the twelve cylinders at the front of the machine, eliminate hand-type wheel lubrication. These feeders are operated by means of compressed air, and the composition paste is delivered through a nozzle to the wheel. Centrifugal force of the wheel in turn carries the composition to a fabric collector pad clamped to one side of the nozzle. This pad contacting with the wheel face applies a definitely controlled film of composition.

Cutler-Hammer Across-the-Line Drum Controllers

A line of a.c. and d.c., across-the-line type, reversing drum controllers for monorail hoists, auxiliary machine-tool motors and for miscellaneous applications has been developed by Cutler-Hammer, Inc., 205 N. 12th St., Milwaukee, Wis. These controllers are made in two- or three-pole types; with radial or rope lever operating mechanism; self-centering or non-self-centering mechanism, and with or without either main-line limit-switch protection or pilot circuit interlocks. The type with pilot circuit interlocks can be used as a reversing switch in conjunction with a separate automatic starter or as a magnetic contactor to provide limit-switch selection in either direction of rotation or to provide magnetic main line operation.

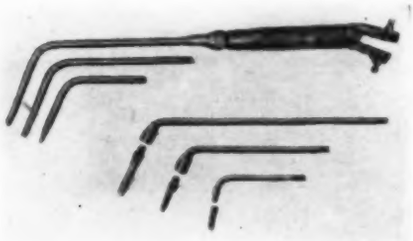


Construction elements include: easy operation, small and compact design, light weight, sturdy drum construction, easily removed, non-stubbing contact fingers, slot-type mounting holes; a feature making it easy to change from self-centering to non-self-centering mechanism, and a shaft extension of 6 in. beyond both ends.



Milburn Type HMS Welding Torch

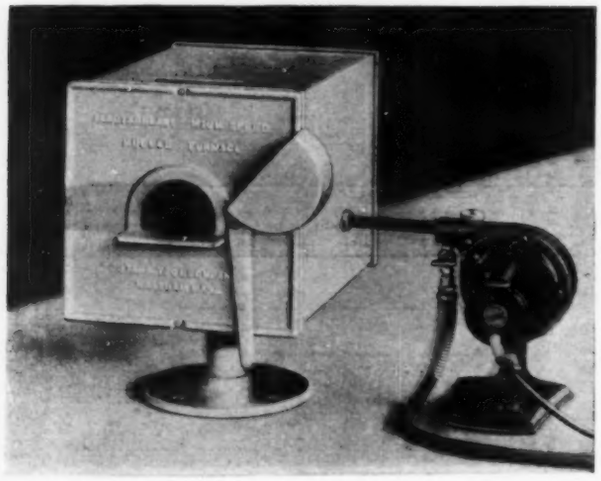
The Alexander Milburn Co., 1416-1428 W. Baltimore St., Baltimore, Md., has announced a Type HMS welding torch for all types of welding. Copper, swaged welding tips



are usually furnished, but they may be removed from the torch handle and replaced by extensions of various lengths. These extensions are light nickel-silver tubes utilizing the company's standard Type FX and UB welding tips.

"Electroblast" High-Speed Muffle Furnace

In connection with its "Electroblast" gas-electric blow torch (*AM*—Vol. 75, p. 644), the Stark Tool Co., Waltham, Mass., has announced a small muffle furnace for which the torch acts as the burner. The furnace is fitted with heavy insulation to make possible a temperature of 1,600 deg. F. in 6 min., 2,400 deg. F. in 15 min., and a maximum temperature of 2,600 deg. F. Muffle dimensions are 6½ in. long, 3⅛ in. wide and 2⅛ in. high, sufficiently large to handle the general run of toolroom high-speed hardening. Operating cost is said to be seven cents per hour. On carbon steel the operating cost is approximately four cents per hour. The furnace is designed so that the work is said to be practically free from scale.



• PATENTS •

JANUARY 26, 1932

Metal-Working Machinery

Grinding Machinery. Sol Einstein, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,842,375.

Milling Machine. Henry O. Fletcher, Ansonia, Conn. Patent 1,842,397.

Feed Mechanism for Machine Tools. Harry L. Rambo, Thomas Addison, and George Langen, Cincinnati, Ohio, assigned to the Cincinnati Planer Co. Patent 1,842,425.

Apparatus For Grinding Gears. Frank Burgess, Wollaston, Mass. Patent 1,842,538.

Apparatus for Grinding Threaded Work. John Bath, Worcester, Mass. Patent 1,842,650.

Grinding Machine. Stanley W. Bath and Harvey M. Allison, Worcester, Mass., assigned to John Bath. Patent 1,842,651.

Bar Pointing Machine. Alfred Emil Voss, Hampstead, London, England. Patent 1,842,704.

Driving Mechanism for Machine Tools, Such as Planing Machines, Grinding Machines, and the Like. Willy Link, Berlin-Karlshorst, Germany, assigned to the Firm Fritz Werner A.G., Berlin-Marienfelde, Germany. Patent 1,842,725.

Power Screw Driver. John Q. Holmes, Anderson, Ind., assigned to Delco-Remy Corporation. Patent 1,842,830.

Grinding Machinery. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,843,079.

Tools and Attachments

Machining Device. (For tubular articles.) Ottis R. Briney, Pontiac, Mich. Patent 1,842,579.

Nut Tapping Attachment for Multiple Spindle Automatic Screw Machines. Milton J. Matthews, Detroit, Mich.

Machine Tool Stop Mechanism. William Schroder, Covington, Ky., assigned to The Sebastian Lathe Co. Patent 1,842,802.

Cam Chuck. James H. Wagner, Muncie, Ind., assigned to General Motors Corporation. Patent 1,843,073.

FEBRUARY 2, 1932

Metal-Working Machinery

Lapping Machine. Sydney Player and Herbert S. Indge, Westboro, Mass., assigned to Norton Co. Patent 1,843,300.

Cam Lapping Machine. Sydney Player and Herbert S. Indge, Westboro, Mass., assigned to Norton Co. Patent 1,843,301.

Continuous Milling Machine. Gustaf David Sundstrand, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,843,345.

Double Center Drive Crank-Shaft Lathe. William F. Groene, Cincinnati, Ohio, assigned to The R. K. LeBlond Machine Tool Co. Patent 1,843,359.

Work Feed for Machine Tools. Paul S. Jackson, Rockford, Ill., assigned to Sunstrand Machine Tool Co. Patent 1,843,365.

Punch and Countersink Machine. William H. Hudson, Detroit, Mich. Patent 1,843,483.

Machine for Forming Screw Threads. Andrew Rodriguez, New Haven, Conn., assigned to Sargent & Co. Patent 1,843,580.

Tools and Attachments

Back Brace for Machine Tool Rams. Robert T. Hazelton, Cincinnati, Ohio, assigned to The Cincinnati Shaper Co. Patent 1,843,362.

Method of Securing Tips to Toolholders. Lewis Gerald Firth, Pittsburgh, Pa., assigned to Firth-Sterling Steel Co. Patent 1,843,549.

Adjustable Work Holder. Ralph R. Weddell, Shelton, Conn., assigned to The O. K. Tool Co. Inc. Patent 1,843,794.

Table Support for Shaping Machines. William F. Zimmermann, Maplewood, and John J. Duffy, Newark, N. J., assigned to Gould & Eberhardt. Patent 1,843,795.

Processes

Metal Tempering Process. (Tool Steel.) John William Brannon, Alsea, Oreg. Patent 1,843,200.

• TRADE PUBLICATIONS •

THRUSTORS. The General Electric Co., Schenectady, N. Y., has issued Bulletin GEA-1262A, superseding 1262, on Type CR9504 Thrustors, which produce a straight-line, constant-pressure thrust from an electric-motor drive.

MOTORS. The Reliance Electric & Engineering Co., 1042-1090 Ivanhoe Road, Cleveland, Ohio, has issued Bulletin 211 on Type T, heavy-duty motors for d.c. operation. The motors range in size from 100 to 350 hp.

MOTORS. The Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., has issued a Bulletin Sheet 173, Part 4, on Type RG brush-riding repulsion-induction motors.

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Reference Book Sheet

MACHINERY VIBRATION INSULATION

THE most general principle of vibration control is that vibration should be damped out just as closely as possible to its source. When the source of vibration is under control, as in the case of a stationary machine in a building, this principle implies that the machine shall be of correct design, properly balanced, and with adequate foundation, thereby preventing so far as possible the occurrence of vibration, or reducing it to a minimum, before any attempt is made to introduce resilient supports or vibration dampers for short-circuiting residual vibration.

When the source of vibration lies entirely outside control, as in the case of vibration in a building arising from street traffic, the use of resilent dampers or isolators often becomes the chief remedy. Also when the problem is to prevent vibration from affecting some particular object, such as a piece of delicate scientific apparatus, local insulation by the use of resilent supports is in general the most effective means of securing results. . . .

High-Frequency Vibration

High-frequency machinery, such as electric generators and motors, centrifugal pumps, fans, and blowers, although well built and dynamically balanced, often sets up very annoying vibrations which travel throughout the framework of the entire structure. High-frequency vibration, however small in amplitude, is readily transmitted to beams and girders of rigid structures, and although it may seem negligible at the source, often reappears with very considerable amplitude at some distant point where it happens to be stepped up by synchronism with the natural frequency of some particular member of the structure. The function of vibration insulation as applied to structures is to isolate either the source of vibration, or some particular object or even entire rooms which are to be protected against such effects.

In the case of reciprocating machines such as steam and gas engines, gasoline motors, and certain types of compressors, there are usually large inertia forces involved which cannot be fully neutralized in the design. Such machines are thus subject to vibration of much greater amplitude than rotary machines, although in general of lower frequency. In the case of stationary machines, the usual remedy is to tie the machine down to a solid foundation of sufficient mass to reduce the amplitude of vibration to a prescribed limit. This use of mass or weight to absorb vibration, or rather to reduce its amplitude, is called inertia damping. Such damping at best is only relative and partial, and there is always residual vibration requiring the use of insulation if it is to be prevented from affecting adjacent structures. Such insulation, however, cannot be applied indiscriminately, either in amount or location, or it may prove worse than useless. In particular, its location with respect to the foundation of the machine must be such as to allow sufficient mass to provide adequate inertia damping. . . .

Simplest Types

The simplest type of vibration insulation consists of a pad or mat of some resilient material placed under a machine. Various materials are used for such machinery insulation, including hairfelt, corkboard, rubber, and other products. Since machinery insulation is ordinarily exposed to the action of oil, water, or acids, it is customary to give the insulation a protective coating of a special paint or asphalt preparation.

Materials such as those just mentioned differ widely in their elastic properties, such as deformation under load and internal damping resistance. Their effective use as vibration insulation requires an intimate knowledge of these properties so that the proper amount and relative dimensions of the material used may be determined with respect to the mass of the machine, frequency of vibration and other essential factors, as explained in what precedes. In the majority of cases, however, compressive pads are used for machinery insulation without discrimination and with absolutely no reference to the vibration properties of the material or the unit load applied, the usual method being simply to mount the machine on a mat of some standardized

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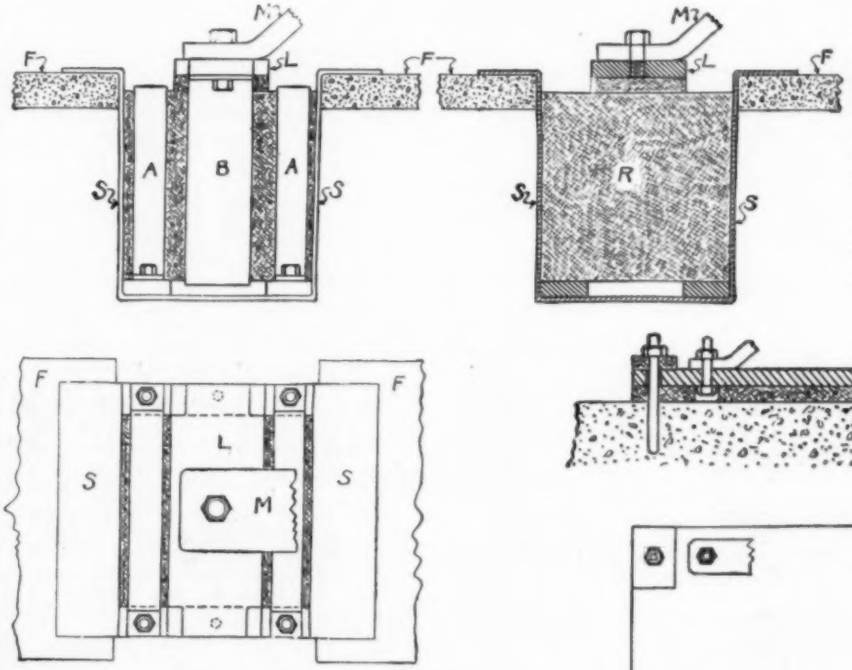

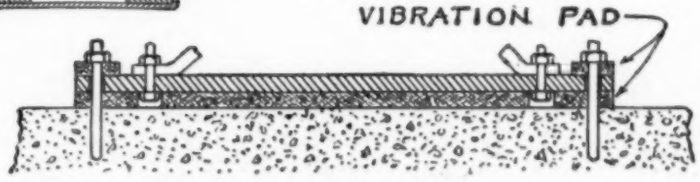

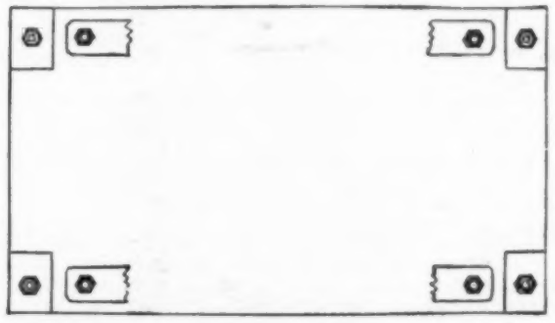

Fig. 1 (Right)—Conventional method of using a compression pad for vibration insulation, and Fig. 2 (Above)—Slocum shear isolator. In Fig. 2, *R* is resilient medium or damper, *A* and *B* anchorage straps, *L* load distributor, *S* steel stirrups, *M* machine foot, and *F* floor or foundation.

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Reference Book Sheet

MACHINERY VIBRATION INSULATION

commercial product. The natural result is that in many cases there is very little damping effect, while in some cases the vibration is made worse; and seldom is such haphazard insulation anywhere nearly as effective as if used intelligently.

Problems of Insulation

For many types of machine it is necessary to provide anchorage. Since any form of rigid connection will transmit vibration, the anchor bolts must also be insulated, both laterally and longitudinally. Lateral insulation around the body of the bolt is easily secured either by leaving an airspace or by a sleeve of insulating material, since in general there is no transverse load. Longitudinal insulation, however, requires an insulating pad under the head of the bolt or nut, which involves the same problem as the use of insulation under the base of the machine, since vibration travels by any path which serves as conductor.

Insulation of anchorage bolts thus complicates the problem in several ways. When the bolts are screwed down, the load both on the compressive pad under the machine base and on the pads under the bolt heads is increased by an undetermined amount depending on the tension in the bolts, and this affects the vibration properties of the entire system. The pad under the bolt head should thus be designed for the load due to bolt tension, while that under the machine base should be designed for the combined load due to weight of the machine plus bolt tension.

The manufacturers of machinery insulation usually furnish a stock detail for use with their product, on the order of that shown in Fig. 1. The result of such practice is always uncertain, and such uncertainty is no longer necessary, since the present state of the art is such that the amount and nature of the insulation required for optimum results may be predetermined by any given mass, load, and frequency. Correct insulation may also be arrived at experimentally by a systematic series of tests proceeding according to a definite schedule. Although this is usually a long and somewhat expensive process, it is well worth the time and effort if a more scientific method is not available.

Steel Spring Insulation

Steel springs form a very effective means for preventing the transmission of vibration when they can be used, but their application for this purpose is somewhat restricted. Sensitive scientific apparatus may be almost completely insulated from the vibration of floors in a building, due to street traffic, elevator operation, or people walking about, by the proper form of spring suspension. Recently spring suspension has come into quite general use for mounting small motors such as those in electric refrigerators. These instances are typical of the conditions under which spring suspension can be used effectively for vibration insulation.

The physical requirement in springs used for this purpose is that their natural frequency shall be low with respect to the frequency of the impressed vibration. In general, this means that the spring shall be relatively weak, that is, that it shall deflect appreciably for a slight increment in load.

For a light spring, that is, one of which the mass may be neglected in comparison with the load it carries, the natural period of vibration, P, is approximately

$$P = 2\pi\sqrt{\frac{d}{g}}$$

where d denotes its deflection per unit load, and g is the acceleration of gravity. Therefore its natural frequency, f, is

$$f = \frac{1}{P} = \frac{1}{2\pi}\sqrt{\frac{g}{d}}$$

Consequently, if d is large, the frequency f is correspondingly small; that is, the weaker the spring, the lower will be its frequency.

Steel springs have become the standard means for cushioning shock or impact, as in the case of car and automobile springs, but the problem of damping non-periodic inertia forces of this type is quite different from that of damping vibration of high frequency and small amplitude. For this reason springs are of limited application in damping vibration. Where they have been tried for this purpose, as in mounting motors in automobile chassis or for supporting floors in buildings, it has been found that if the springs are stiff enough to furnish the stability required of such constructions, their natural frequency is much too high to make them effective as vibration dampers.

Shear Loading Best

An important consequence of our tests was the discovery that the most effective means for developing the elastic properties of a resilient material used as vibration insulation is to load it in such a manner that the principal strain in the material shall be shear.

Starting with this basic principle, the requirements for an effective vibration damper may be specified as follows:

1. The principal strain in the resilient medium should be shear;

2. The resilient medium should be concentrated in units of convenient size in order to afford control of the unit load and unit deformation, thus fixing the natural frequency of the damper and thereby making it possible to entirely avoid synchronism;

3. Anchorage must be obtained without impairing the vibration properties of the damper;

4. The isolation units must be compact, and so designed as to require little space for installation and not materially alter the elevation of the bed-plate of the machine;

5. The isolation unit should be so designed that it may be manufactured in stock sizes, each size covering a limited and definite range of unit load and unit deformation; likewise natural frequency.

The vibration damper shown in Fig. 2 is designed to fulfill these specifications, and is called a *Shear Isolator* to indicate its basic features.

By inspection of the figure it is evident that the load is not carried directly over the rigid supports but between them, thereby developing a resistance of pure vertical shear in the resilient medium. Furthermore, by altering the span slightly, flexural strain may also be introduced to any desired extent as a supplement to the principal shearing strain.

Insulation of load from supports is complete, the entire load passing through the resilient medium with no possibility of grounding, and in such manner that the strain in the material under a given load is definitely fixed and known.

Built-Up Insulating Medium

The resilient medium is not pierced with bolts or attachments, but is entire and intact, and assembled in a single rectangular black or in several such blocks placed together on edge. In the latter case, since the joints are in vertical planes and the layers firmly bound together, each section develops its full strength in shear or flexure, as the case may be. By building up the insulating medium in sections, the size and capacity of a unit may be altered at will in the simplest possible manner.

Anchorage is secured without sacrificing the strength of the resilient medium by cutting or drilling, and without the uncertainty which usually attends the secondary insulation of anchorage bolts. The damper is thus equally strong in either vertical direction, that is, upward or downward.

An especially important feature is that individual units may be actually tested for unit deformation and damping resistance, and their vibration properties thus fully determined in advance of installation. This eliminates the uncertainty which usually attends the use of resilient pad insulation, even when samples of the material are pretested.

The unit is also designed to be installed in pockets in the floor or foundation, which serves the double purpose of protecting the damper, and of maintaining the level of the machine at practically the same elevation as if no damper was used.

These insulation principles have also been developed in other forms than that shown in Fig. 2, in the shape of units specially adapted to rest directly on floor surfaces, without cutting or special construction features, or to serve as supports for anti-vibration platforms used as machine bases, and are protected by separate patent applications.

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EDITORIALS

February 18, 1932

K. H. CONDIT • F. H. COLVIN
Editors

The Turn?

Two things happened last week that may well have marked the turn in business. Washington announced a plan to make the Federal Reserve more flexible and hence more nearly able to accomplish the purpose of the originators of that financial body. Henry Ford announced plans for early display of his 1932 line.

The Washington action affords further evidence of a willingness on the part of the National Government to face facts at last. Although the legislation introduced to broaden the base of Federal Reserve credit comes many months later than it should have come, let us not condemn it on that account. Let us be thankful that there is apparently a resolve to cease the drifting policy and take steps to stop the progress of deflation. With banks once more in a position to finance reasonable business activity there is every reason to hope that the consumer will shake out a reef or two from his purse and that industry will be encouraged to abandon the disastrous policy of deferring improvements and maintenance.

Of equal importance to the metal-working industry is the Ford announcement. With the railroads crippled by lack of traffic and sadly compromised credit, and consequently practically unable to purchase materials or equipment; with the heavy equipment industry similarly situated, and light manufacturing doing little better, hopes have been centered on the automobile builders.

No one can question the courage of this group. They gambled on the shows to the extent of heavy investments in engineering development and general advertising; their efforts were greeted by record crowds, but buying lagged. Mr. Ford was not ready, and the buyer decided to wait and see what he would develop. The industry marked time, and the expected business for those who sell to the industry failed miserably to materialize.

But the new Fords will be on view inside of a month. Curiosity can be satisfied; trade may take its usual course. With the banks able to finance trade, "Out by Easter" may soon be more than a pious hope.

The Philosophy of Sammy Squirrel

Back in the days when we went to school, little Sammy Squirrel was held up to all of us as the one and not-to-be-questioned model of personal thrift. And it is not a little hard for many of us to jettison our squirrel philosophy at the behest of President Hoover's anti-hoarding campaigners. Nuts in a hollow tree can be neither frost-bitten nor frozen by the collapse of a bank.

But somehow or other, money is not like a nut. It has three aspects: its value as money; its commodity value as a metal; its supreme value in our civilization as the foundation of credit. Until we stop to think about it a dollar is only a dollar, or just so much metal to be hammered into spoons and watch cases. It comes to us as a shock when we discover that one single round dollar can be the basis of ten or more dollars of credit. And credit is the very life of commerce and industry. Every dollar out of circulation, whether in the old family sock or the safety deposit box, automatically destroys ten dollars of business life. With over one billion five hundred million dollars hoarded away in the United States, there can be little surprise at the low ebb of all business.

A dumb and squirrel-like self-interest brought about this condition; paradoxically, an intelligent and human self-interest will cure it. Granted that many banks have lost all claim to confidence and respect, there are sound banks in our various localities to which we can refer ourselves and our

employees with entire confidence. Granted that we cannot find any such, we can still put our hoarded cash in postal savings or in U. S. Government bonds at their present ridiculously low prices, thus securing the guarantee of the strongest nation in the world. We cannot and must not allow ourselves to forget that our metal-working industry needs business, that we cannot get business without credit, that in this emergency we have no right to expect credit without doing everything we can ourselves. For once we must desert Sammy Squirrel's philosophy. Forget patriotic duty if we will—self-interest demands prompt action.

CHIPS

Three factors combine to initiate what may develop into a genuine bull market . . . Ford's forthcoming announcement of his new fours and eights . . . Glass-Steagall banking bill to permit broadened base for Federal Reserve discounts . . . Announcement that Reconstruction Finance Corporation is ready for business . . . No exaggeration to say that national morale jumped ten to fifteen points in sympathy with stock and commodity markets . . . Even the Treasury announcement that original estimates were falling $455,000,000 short failed to dampen ardor . . . 122 independent business executives, gathered in Washington to study economic rehabilitation, ask two-year truce on anti-trust laws . . . President Hoover appears cool to the request . . . Federal unemployment relief gains favor in both Houses . . . American Legion "war against depression" and unemployment gets off to flying start.

> If we ran an "Oh yeah?" column, the following item from Washington would be up near the top: "Eighty per cent of the people in the country are better off than they were in 1928. Their dollars buy more. The country is better off in that it has gotten rid of many inefficient banks, and many inefficient establishments in all lines of endeavor. This opinion was expressed by a prominent democrat."

Undeclared War appears to gain momentum . . . Japan places principal orders for munitions steel in Europe . . . some in U. S. . . . Japanese cabinet approves $14,500,000 appropriation for naval and military operations in Shanghai . . . also to finance operations in Manchuria . . . London *Daily Mail* claims U. S. S. R. and Japan have entered pact to give latter undisputed dominion over Manchuria and parts of Mongolia . . . Both nations deny vigorously . . . Geneva Disarmament Conference still in speech-making stage . . . Europe pretends to view U. S. nine-point plan with alarm . . . Long deferred conference on German reparations probably to take place in Lausanne during June . . . French import quotas on machine tools, electric motors, etc., draw protest from American Chamber of Commerce . . . favoritism toward Germany and Italy charged . . . European exchange rises on suspicion of dollar inflation . . . and coverage may be in order.

> Evidence accumulates that several large organizations in the metal-working industry are buying quietly, very quietly. They do not wish to see a stiffening or an increase in prices. One automobile manufacturer even complains about slow deliveries on machine tools.

Pressed Steel Car Company secures 100 steel refrigerator car order from Western Fruit Car Express . . . secured 150 steel lumber car order from Northern Pacific ten days previous . . . Ford orders 1,000,000 new type distributors for new "8" from Mallory Electric Corporation . . . Burlington to spend about $23,000,000 in 1932 for maintenance, improvements, extensions . . . General Electric distributes $55,739 for employee suggestions in 1931 . . . N. Y. Telephone plans expenditures of $76,000,000 in 1932 for plant additions, betterments, replacements . . . Through new contract with White Company, Indiana Motors Corporation will step up delivery schedules 300 per cent beginning March 1.

Recovery almost bound to come first in consumer goods . . . Significant that Mohawk Carpet earned $310,673 in 1931 against deficit of $599,779 in 1930 . . . Congoleum Nairn earned $1,239,666 in 1931 compared with but $208,839 in 1930 . . . Dun's monthly index of average commodity prices stood at 141.34 on February 1 . . . at 140.68 on New Year's Day.

> A subscriber writes us that he is figuring on a set of dies for forming a complete kitchen sink. He is beginning to wonder when he will be making punches and dies for all the rest of the household furniture and equipment.

With Ford virtually out of production, January automobile shipments totaled 126,516 units against 123,956 in December . . . January Kelvinator refrigerator shipments top 1931 January by 23 per cent . . . previous high . . . Retail sales at Chicago Automobile Show exceeded 1931 by 55 per cent . . . Cadillac and LaSalle January production topped any previous January except 1929 . . . Reo commercial car sales in January exceeded corresponding month of last year for sixth consecutive month . . . Remington Rand's domestic typewriter sales in January surpassed December . . . and December surpassed November 46 per cent.

New York Central recalls 1,100 men to Collinwood, Ohio, locomotive shops . . . Chicago & Northwestern returns 500 to Chicago locomotive shops . . . Locomotive department of Indianapolis Big Four Shop resumes regular operations with full force of 1,200 . . . A. O. Smith Corporation operates with force of 4,000.

Inland Steel purchases Mt. Cooper Boiler Company . . . Byer-Anderson Company and Phoenix Iron & Boiler Works consolidate as Byer-Anderson-Stocker Company . . . will operate in Byer-Anderson plant . . . Continental Motors makes highest sealed bid for DeVaux-Hall Motors Corporation, in receivership . . . Atlas Mfg. Corporation purchases plant of Air-More Products, Inc. . . . Foundry Equipment Company purchases business of McCann-Harrison Company . . . Great Northern to begin construction of machine shops and roundhouse at South Klamath, Ore.

• THE • INDUSTRY • WEEK • BY • WEEK •

NEW YORK

Good and "just fair" weeks seem destined to alternate for some time to come. Some dealers have more inquiries and have increased closings; others had an exceptionally quiet last week. Bids have been received on lists that were outstanding, and no new ones have been released. The Navy is taking an occasional tool, but not for this area. Sentiment is a little better, matching better feeling in Wall Street.

NEW ENGLAND

The situation does not yet offer any indication of sustained buying strength. New England interest centers principally around outstanding lists from the Navy Department, automobile companies and possible business from the electric refrigerator manufacturing industry. The extent of automotive purchases cannot be anticipated with any degree of accuracy. Nash, Ford and Chrysler are actively interested in grinding and milling equipment and miscellaneous tools.

BUFFALO

Business for January proved about the same as that for December. Very few orders were placed, and prospects for February are nothing to be excited about. In the electrical equipment branch it seems quite clear that the volume of sales in January was slightly under that of December. There seems to be little belief that February business will be any better. In contractors' equipment January business was low.

CINCINNATI

Business of machine tool manufacturers and local selling agents continues at a monotonously low level. The greater portion of the orders come from general machinists and miscellaneous users, requirements in most cases being but one item. As a rule, inquiries are at a low point, but a few concerns receive a fair number. Most inquiries are tentative, however, and buying depends on need arising on the part of the user.

CHICAGO

Inquiry for machine tools shows little, if any, improvement. Occasional requests for quotations on important units continue scattered. When infrequently received, they are followed up with celerity. Certain types of grinding machinery, as noted a week ago, seem to be in better demand. Manufacturers' representatives and selling agents optimistically look for a gradual upturn, and to that extent are hopeful. Demand for small tools is fairly well maintained. Dealers specializing in used tools report few inquiries and fewer sales, such little closing as is effected being at prices leaving scant margin of profit.

Progress in Metal-Working and Machinery Markets

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SOMNOLENT tool markets show too few signs of Spring awakening . . . Governmental and private efforts to revive general business have stepped up enthusiasm, but actual orders seem not to have heard about the turning of the corner . . . N.M.T.B.A. indexes reflect this condition, the general order index slipping from its 67.6 of December to 59.1 in January, which however, is still better than November's 50.8 . . . The 3-month average is 59.2, up 5 points from last month, a result of the dropping of figures for a very poor October . . . Two groups, B ($10-$50,000 shipments per month) and C (Under $10,000) show gains over December, B going from 76.6 to 78.4, C from 67.3 to 81 . . . But A (Over $50,000) dropped from 65.1 to 52.8 . . . Analysis of orders shows "lightning-like" tendency noted here several weeks ago—orders hitting with neither rhyme nor reason.

NEW YORK, watching Wall Street, feels better but buys no more . . . New England is interested in Navy and automobile lists and possible refrigerator lists, with Nash, Ford and Chrysler interested in grinding and milling equipment . . . Buffalo feels bad all the way round, though January held December's level . . . Cincinnati reports nothing new . . . Chicago is selling some grinding equipment and small tools . . . Used equipment is still hard to sell at rock-bottom prices.

DETROIT has sold some toolroom equipment and used machinery, the first to Ford, the used units to aid in tiding over . . . One good inquiry, not automotive, is out there . . . Indianapolis, cheered by increasing employment and inquiries, expects substantial improvement soon . . . Present sales are to garages and aircraft hangars . . . Southern District sales are poor, usually to schools or specialty shops, some of which are reasonably active . . . Some oil tool shops, faced with no business, are diversifying . . . Canada's inquiries are cheering—her sales disappointing.

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DETROIT

A few sales of tool room equipment, several inquiries and the movement of a number of pieces of used machinery constitute the only activity. Sales and inquiries are still exceedingly scarce, most of the automotive manufacturers being content to mark time. One good inquiry has been received from outside the automobile field. Ford has been placing some orders for toolroom equipment, following its purchase of a large number of grinders and other equipment.

INDIANAPOLIS

In spite of the fact that sales show no particular life, the tool trade here is in a better mood, due largely to an increase in offerings and reports from various parts of the state of men going back to work in large numbers. For example, Feb. 15 the big shops of the Big Four lines in Indianapolis will put 1,200 men to work, the first activity in three months. Warner Gear will put 500 additional men to work in Muncie. These are typical of reports being received from the industrial centers of the state. Pressed Car Co. in 10 days received orders for 250 steel cars. And some inquiries are being received that should lead to business. Some of the inquiries are coming from road contractors, who are certain to need replacement equipment this year. Some small equipment is sold to garages and airplane hangars.

SOUTHWEST

The business of furnishing machine tools and shop equipment in general is still in a quiescent state. Certain tools are sold, as to school trade shops, where in spite of curtailment of educational budgets some new equipment now and then is bound to be purchased. Certain specialty shops, reasonably active, are in contrast to most places of the kind, although like the latter they are ordering little equipment. Oil tool shops are still quiet; some people in this line are turning to other lines of production.

CANADA

Inquiries for tools are reported encouraging, but sales are disappointing. Industry is moving slowly, and buyers appear hesitant. There has been little activity in the iron market, and car-building and locomotive shops are operating on reduced time. Production of steel and heavy machinery has been restricted. Agricultural implement makers are providing more employment, but they are considerably short of a full complement. Demand for general hardware is moderate. The Automobile Show in Montreal attracted an unusually large number of prospective buyers, but sales on the spot were no better than average. Orders from electrical manufacturing concerns are increasing.

MATERIAL TRENDS AND PRICES

With record low points reached last week in three important indices of the steel trade, namely, unfilled tonnage, structural awards, and scrap prices, but little remains to point the way to a more active market except the prospective demands of the carriers. Automotive requirements, moreover, are below expectations at this time. In non-ferrous metals, new lows were touched during the last week in tin and copper, while lead remained unchanged. A very slight improvement is apparent in demand for zinc.

(All prices as of Feb. 12, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$10.00@$11.00	$11.00	$13.00
Buffalo, No. 2, Fdry., per gross ton	14.00@ 15.00	15.00	17.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	12.75
Furnace Coke — Connellsville, per net ton	2.25	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb.	1.50	1.50	1.65

Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.35	Detroit	4.00		

Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.85	3.20	3.00	3.00
Hot-rolled, No. 24	2.40	3.55	3.25	3.50
Galvanized, No. 24	2.90	4.10	3.75	4.00

Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches					
		½	⅝	¾	1	1⅛	1¼
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.60	3.60
Cold fin., round or hexagon	3.30	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots 73–10–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	6.00
Copper wire, base, Chicago and Cleveland	9.62½
Copper wire, base, N. Y.	9.50
Lead, pigs, E. St. Louis	3.55
Tin, Straits, pigs, spot, N. Y.	21.50
Zinc, slabs, E. St. Louis	2.80
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	10.62½
Brass sheets, high	12.87½
Brass tubing, high	16.12½
Copper, drawn round	13.37½
Copper sheets	15.87½
Copper tubing	15.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	17.25
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.25	2.75	2.75
Light brass	2.00	1.50	2.37½
No. 1 rod-brass turnings	2.25	3.00	2.50
Heavy copper	4.00	4.50	4.12½
Light copper	3.25	3.75	3.62½

SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	40%	40%	40%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60%

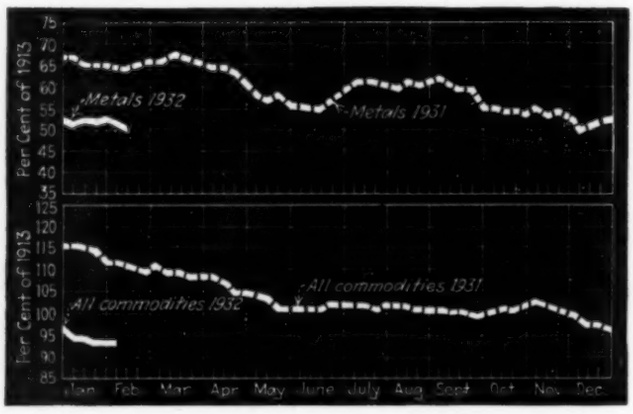
Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:

1x4-in. ..... $27.00 1x6-in. $26.00

Skids — Spruce:

2x4-in. .$25.00 3x4-in. .$35.00 4x6-in. .$37.00 6x6-in. .$50.00


Per Cent of 1913
Metals 1932
Metals 1931
Per Cent of 1913
All commodities 1931
All commodities 1932
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index The Annalist

Ford to Re-employ 30,000 Workers

With the beginning of production of the new Ford eight and four cylinder lines, employment will be increased by 30,000 to 35,000 workers still on the rolls and awaiting rehiring. The recall is likely to start in a day or two. This Ford announcement is regarded by financial and industrial leaders as the biggest piece of news since the "business illness" began more than two years ago and as a harbinger of brighter days not only for the automobile industry but also throughout general business.

—*New York Times*

A.F.A. Announces 1932 Nominees

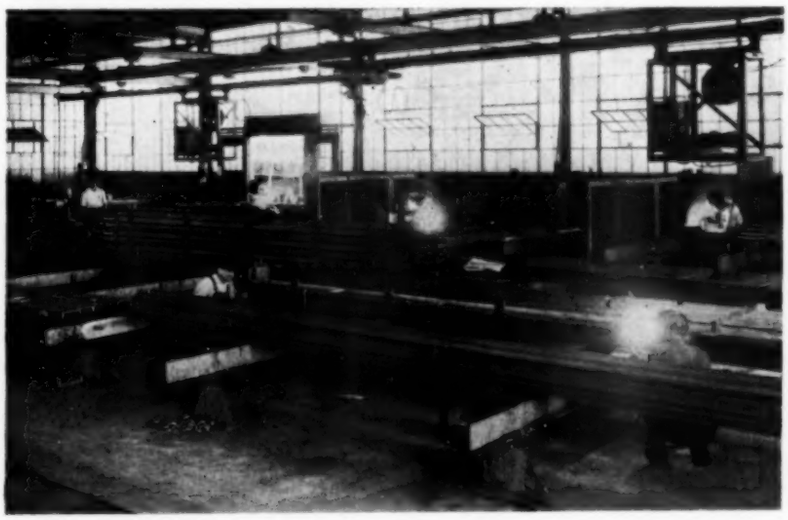
A nominating committee of American Foundrymen's association has nominated for officers and directors, for election at the Philadelphia convention, May 2-6, the following: For president—T. S. HAMMOND, president, Whiting Corp.; for vice-president, FRANK J. LANAHAN, president, Fort Pitt Malleable Iron Co.; for directors (3-year terms) E. H. BALLARD, general foundry and pattern shop superintendent, General Electric Co.; H. BORNSTEIN, director, testing and research laboratories, Deere & Co.; S. B. CUTHBERT, superintendent of foundries, Edgar Thomson Works, Carnegie Steel Co.; DAVID EVANS, president, Chicago Steel Foundry Co.; and FRANKLIN G. SMITH, president Osborn Mfg. Co.

Noise Measurement Committee Formed

Organization of a sectional committee on noise measurement under procedure of the American Standards Association was recommended by a general conference of 32 representatives of 18 national bodies held in New York, Jan. 29. It was also recommended that the committee function under technical leadership of Acoustical Society of America. For the present, the committee's work will be concentrated chiefly on standardization of nomenclature, units, and scales. The "Steering" committee consists of PROF. VERN O. KNUDSEN, Acoustical Society of America; E. E. FREE, A.S.M.E.; P. L. ALGER, A.I.E.E.; H. R. SUMMERHAYES, National Electrical Manufacturers Association; R. G. MCCURDY, ASA Telephone Group; and DR. HARVEY FLETCHER, Acoustical Society of America.

Railroad Income 1.98 Per Cent

Class I railroads in 1931 had a net railway operating income of $531,095,960, a return of 1.98 per cent on their property investment, according to complete reports for the year just filed by the carriers with the Bureau of Railway Economics. The net railway operating income in 1930 was $884,856,141 or 3.36 per cent on their property investment. Property investment is the value of road and equipment as shown by the books of the railways, including materials, supplies and cash. The net railway operating income is what is left after the payment of operating expenses, taxes and equipment rentals but before paying interest and fixed charges.



Austin Company's new "weldery" in Cleveland. Formerly Bliss Mill, this plant will be devoted exclusively to fabrication by welding, making "weldings" for machine and equipment builders

Overhead Reduction Taylor Subject

New York Metropolitan Section of Taylor Society is holding a dinner meeting this evening on the general subject of "Control and Reduction of Overhead in Relation to Depression Periods." WALTER RAUTENSTRAUCH, professor of Industrial Engineering, Columbia University, will be the speaker, and LOUIS F. MUSIL, treasurer of Cities Service Co., will be the discusser. WILLIAM E. YEOMANS, Merchants Association of New York, will be chairman of the meeting.

Illumination Course Planned in April

A general course in illumination will be held Apr. 4-8 at the General Electric Lighting Institute, Nela Park, Cleveland, Ohio. While the course will cover much the same material as previous general lighting conferences, special emphasis will be given in the program to the commercial lighting fields, such as store lighting, gas station lighting, etc., which are less influenced by general business conditions than industrial, street lighting, and other fields of that nature.

Marketing's Relation To Machine Age Topic

A survey and discussion of "The Machine Age and Its Relation to Marketing" will be a high spot of the conference on consumer marketing to be held Mar. 9 as part of the program of the Second Packaging, Packing and Shipping Conference, Clinic and Exposition at the Palmer House, Chicago, Mar. 7-12. Speakers will include JOSEPH HAYS, of Crowell Publishing Co.; L. R. BOULWARE, general sales manager, Syracuse Washing Machine Corp.; JOHN SULLIVAN, marketing staff, American Management Association; and A. T. KEARNY, of James O. McKinsey Co.

N.A.C.A. and A.M.A. Sections Meet Jointly

National Association of Cost Accountants, New York Chapter, and the New York group of American Management Association, held a joint meeting, Feb. 16, at the Edison Hotel, New York City, on the general subject of "Managerial Control of Sales Products and Markets." T. M. MCNIECE, manager, sales records and research, Union Carbide Co., was the speaker, and R. A. BALZARI, manager, marketing counselors staff, McGraw-Hill Publishing Co., Inc., led the discussion.

German-American Machine Trade 1925-1932

Machine interchange between the U. S. and Germany shows a continually rising tendency. Active and passive balances alternate from the one country to the other at periodical intervals of two years

By Our Berlin Correspondent

THE two leading machine exporting countries of the world, the United States and Germany, participate in a particularly intensive interchange of machinery. This is chiefly demonstrated by the fact that Germany takes first position in the list of countries exporting machinery to the United States, while on the other hand that country is the leading supplier of the German market with foreign machines. As shown in Fig. 1, the values of machines taken by both countries have, on the average for a number of years, been almost equal. Since America's import of machines on the whole is lower than that of Germany, the latter covers a larger share of American machine imports. Germany provided in 1929 about 40 per cent of American machine imports, while America's part of German machinery imports for 1929 amounted to only about 20 per cent.

Apart from the last two years, which, as a result of the extent of the world crisis, were bound to bring about a setback in the machine trade, both countries show a continual development within the scope of the general increase in foreign trade in machinery. On the basic tendency towards gradual extension of mutual buying connections, considerable fluctuations have occurred, which have, during latter years, had contrary directions for both countries. Thus the balance of the mutual interchange of machinery of both countries is alternatively active and passive. The total values of machines the countries purchase from each other are almost equal on the average over several years. Surplus exports in favor of the one or the other of the two countries vary, and are balanced in the long run.

In the first quarter of 1925, initiating the curve, exports of both parties are equal, thus balanced. At later times, the curves diverge several times, only to cross again at almost even intervals of two years each. Thus from the beginning of 1925 to the same time in 1927 an export balance in favor of Germany resulted, which, during the same period from 1927 to 1929 was compensated for by an American surplus in machine exports. From 1929 to the middle of 1930, the curves consistently marked an active surplus in favor of Germany; however, the symptoms of the world economic crisis are already noticeable in the decreasing turnover. In the further course of the world crisis, 1930-1931, the strong variations noticed during the years of good conjuncture lessen considerably. A slight export surplus in favor of the United States is observed.

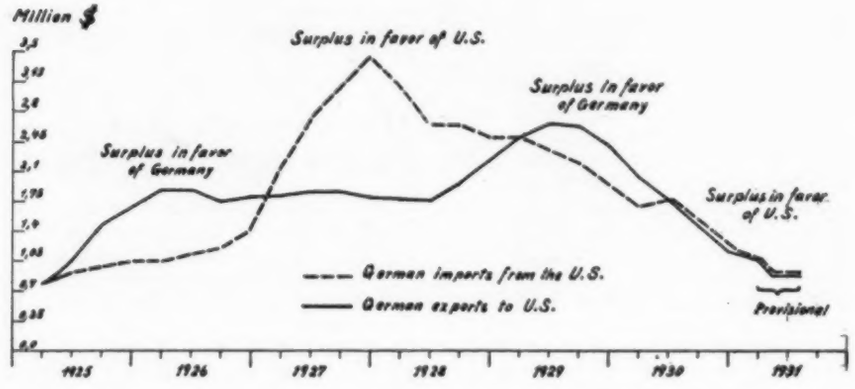


Fig. 1—(Above) Machine Interchange Between the U. S. and Germany

To avoid less important variations flexible means have been calculated (intervals = 4 deg.), also, movement in prices were neutralized by means of the German machine-price index.

In considering the mutual machine exports of the U. S. and Germany in the different groups of machines, the following survey is presented:

Of the various groups of machines, that of textile machinery takes first place (Figs. 2 and 3 and Table 2). While German imports of textile machines from the U. S. are quite insignificant, and have been almost constant in late years, almost half of the German machine exports to the States consist of textile machines. In the first instance these include knitting and weaving machines, for which Germany leads in the world market. The German share of the United States' total imports of textile machinery was about 70 per cent in both 1928 and 1929. Germany's sales of textile machines to America show the same rising tendency as its entire machine exports to that country, their periodical variations coinciding exactly with the movements of the American market.

Import and export conditions for machine tools of the countries are quite different, however. It is true that exports in both countries have increased in this group too, though only to a small extent, and that they also adhere

TABLE I—EXPORT TRADE IN MACHINES BETWEEN GERMANY AND THE UNITED STATES, IN QUARTERLY FIGURES

Period	Quarter	German Machine Imports from the U. S.	German Machine Exports to the U. S
		(*in 1,000 dollars*)	
1924	4th	500	734
1925	1st	600	735
	2nd	1,120	927
	3rd	1,150	992
	4th	1,175	1,870
1926	1st	848	2,674
	2nd	1,354	1,767
	3rd	1,090	2,050
	4th	1,548	1,756
1927	1st	1,227	1,997
	2nd	2,270	1,996
	3rd	4,335	2,126
	4th	3,995	1,992
1928	1st	2,800	1,985
	2nd	3,902	1,840
	3rd	2,967	2,067
	4th	2,266	1,930
1929	1st	2,770	3,015
	2nd	3,408	3,054
	3rd	2,941	3,355
	4th	1,736	2,694
1930	1st	2,072	2,986
	2nd	2,250	2,172
	3rd	1,842	1,704
	4th	2,037	1,340
1931	1st	797	1,545
	2nd	1,153	1,000
	3rd	1,123	975
	4th	.....	.....

TABLE II—MACHINE INTERCHANGE BETWEEN THE UNITED STATES AND GERMANY, LISTED BY CLASSES

German machine imports from the U.S.	(*in thousand dollars*) 1924	1925	1926	1927	1928	1929	1930	*1931
Textile machinery	676	459	714	632	612	675	456	163
Steam locomotives	....	....	....	....	....	....	2	....
Machine tools	163	2,002	910	1,780	2,107	1,490	1,119	407
Agricultural machinery	403	200	320	310	432	299	178	35
Other machinery	249	1,090	2,329	7,932	7,451	7,168	4,502	2,029
Boilers, parts and accessories	134	323	279	1,112	1,266	1,237	920	437
	1,625	4,074	4,552	11,766	11,868	10,869	7,177	3,071
German machine exports to the U.S.	1924	1925	1926	1927	1928	1929	1930	*1931
Textile machinery	1,428	2,240	4,172	4,552	3,709	5,913	3,049	811
Steam Locomotives	.....	.....	.....	.....	.....	.....	.....	.....
Machine tools	412	782	1,832	917	825	1,394	1,023	740
Agricultural machinery	0.50	0.43	0.36	0.36	0.40	164	55	31
Other machinery	912	974	1,514	1,834	2,431	3,404	2,491	1,301
Boilers, parts and accessories	269	481	631	776	818	1,251	1,430	621
	3,021.50	4,477.43	8,149.36	7,079.36	7,783.40	12,126	8,048	3,504

*1931 figures based on first nine months plus one-third.

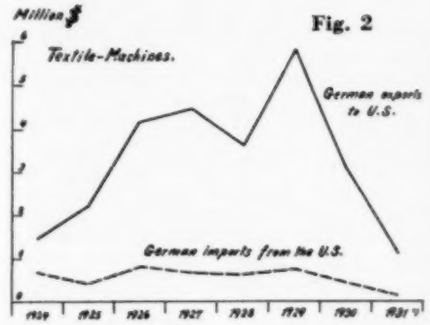
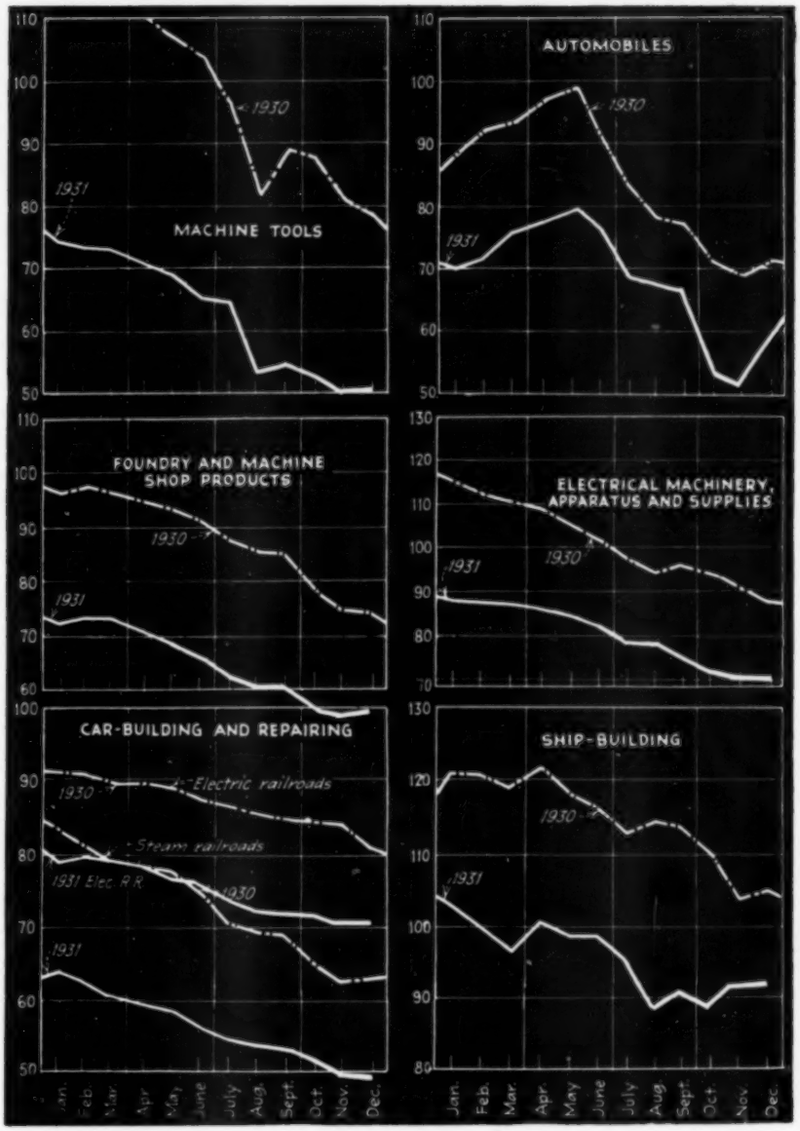


Fig. 2

Fig. 3

*) The ciphers for 1931 have been calculated from January to September 1931 plus 15.

to the above mentioned alternative movements of the market developments of both countries. Contrary to the textile machine group, though, the trade balance for machine tools of both countries is unfavorable for Germany, but this difference is not considerable. Furthermore, it marks a clear tendency to decrease further. Apart from this, the alternating machine tool exports are a typical example for the exchange of specialities and presenting an altogether healthy appearance between two highly industrialized countries.



Trend of Employment in Metal-Working Industries Monthly average for 1926 = 100. Data supplied by the Bureau of Labor Statistics

An Accident Record

Seven factories of American Can Co. operated in 1931 without a single lost-time accident. The operations involved a total of 1,620,447 man-hours, or an average of 231,500 man-hours per factory, which were all working on a reduced schedule. The answer probably lies in automatic feeding of punch presses and other can-making machinery.

G.E.Pays $55,739 for Employee Suggestions

General Electric Co. awarded $55,739 for suggestions made by employees in 1931. Employees made 19,595 suggestions during the year, an average of 428 per 1,000 employees, and 6,383 of the ideas were found to have merit. During the year 32.6 per cent of the recommendations were acted on favorably, against 32.1 per cent in 1930.

THE BUSINESS WEEK

February 17, 1932

The first week of February has brought no break in the spell of business and security market stagnation . . . Signs of seasonal pick-up, almost invariably marked by the middle of this month, are so far very slight and scattered . . . Car-loadings and electric power production are moving almost horizontally . . . Despite some revival of railroad buying, the spring rise in steel is being held back by slackness in automotive output due to delays in Ford's new models for which buyers and other producers are disposed to wait . . . Commodity and stock price averages have sagged to new lows and bonds lost a large part of their gain since December . . . Effects of Reconstruction Corporation action in checking bank credit contraction are not yet forthcoming, and European affairs are rapidly approaching new financial and political crises . . . More fundamental for the domestic outlook is the fact that capital values are being steadily depreciated by drastic reduction in employment and buying power of employees, upon which corporate earning-power now depends . . . The drying-up of private monetary and credit resources is resulting in growing pressure for governmental relief and rapidly forcing resort to the public credit to replace the purchasing power destroyed by deflation and liquidation in the banking system or immobilized by individual hoarding . . . If the Reconstruction Corporation cannot secure prompt private banking cooperation in assuring speedy credit expansion, it may be necessary for government to invoke its constitutional powers to regulate the currency and provide directly an adequate and indispensable medium of exchange.

© The Business Week

Political and Economic Conditions Cause France's Industrial Decline

By Our Paris Correspondent

THE political and economic situation of France has brought about its industrial predicament of the moment. There is no visible turning in the maze of confusion which can be counted upon to improve the latter before the two former problems are at least clarified, if not solved.

The continuation of the "standstill" agreement respecting Germany's short-term borrowings abroad, if supported by France for the possible benefit of her reparations due, is the greatest retarding influence against a universal prosperity which Europe has known since the end of the war.

M. EUGENE SCHNEIDER, head of the famous Creuzot works, has sought to stimulate the French metal industries by wise counsel set forth in the "Cahiers de l'Industrie Francaise." He argues for *ententes*, consortiums and trusts, beginning with research and ending where they may. Primarily his plea is for avoiding brusque price fluctuations and eliminating irrational competition.

SEN. GASTON JAPY once more comes to the breach and preaches the necessity of import contingents beyond which foreign-made tools, machinery, automobiles, typewriters and kindred merchandise may not be imported at all. This means prohibition, something which the League of Nations Economic Committee has sought to obviate by multilateral conventions between governments for three years past, ratified by France only with reservations. In any case the object is to reduce the flow of manufactured imports into France, if not actually stop it, whether they be production goods or manufactured goods.

On the basis of the banner year of 1929 in French industry, with an index of 100, the general mechanical trades fell to 91 in the mid-year of 1931. The automobile index fell to 88 and metallurgy in general to 86. The two latter were the lowest of all items, the highest index applying to the production of paper—103.

French imports of manufactured products have increased to the index of 170.5 (compared with the 100 index of 1928, while materials for industry have increased only to 112. Exports of manufactured articles meanwhile have fallen to 86.3.

Trade Balance Debit

French foreign trade balances for 1931 have gone the way of those of most other countries, except that the debit balance is greater than in some others. Germany in ten months exported to France 50 per cent more in value than in twelve months of the preceding year. Italy, Spain, Holland and Belgium held their own for the period cited, not counting what may have accrued further in the last two months. French exports to Germany were reduced one half, as they were to Belgium, while one third was nearer the figure with respect to the other countries.

"Our backs are to the economic wall of realities for which we demand a prompt and clear-cut solution," says Monsieur Schneider.

Automobile Exports Drop

The automobile industry appears to be making headway but slowly; its export trade has dropped to derisory proportions if one considers its rapid progress registered five years ago.

French agricultural machinery and tools, so far as the industry goes, have at least a future, both in home and export trade. Plant equipment is being improved and a generally better product is being turned out. Nothing, however, indicates that present equipment is not equal to demands upon it, the industry depending largely upon outside makers for the more highly finished accessories and parts.

Naval construction is in a sorry plight. Work has been recommenced on the *Super Ile de France*, but more as an expression of *amour propre*, in reply to the British funking of the new Cunarder, than by economic justification. The ship-building industry as a whole is headed toward total paralysis, according to a shipping authority.

The small tool industry, drills, saws, files and grinding appliances, is to large extent filling orders from stock. It is estimated that home market absorption fell off 8 per cent and export sales 40 per cent during the past year. Imports of small tools from Great Britain are increasing, affecting both French production and imports from Germany.

Imports of drilling, grinding and rectifying machine tools of more pretentous dimensions and capacities have affected the interior market to the extent that they have been singled out as worthy objects for development by home industries, above all as they pay an import duty of 80 francs up to 290 francs the 100 kilos. The bigger the machine the lower the tariff ratio.

A new patent law is in project by which French *brevets* will not compel the inventor, patentee or owner to exploit them, suppresses various formalities for conceding working rights and prolongs protection for twenty years. The brevet must, moreover, be presented and "deposited" (registered) in the name of the inventor which opposes the "collective brevet" formerly granted. The latter clause is considered as protecting the rights of the individual as against an employing organization which might have made a hard bargain for working rights. The registration fee is increased from 360 francs to 1,000 francs.

Unemployment

The barometer of unemployment still registers vaguely when expressed in official figures (sic) units but the increase in "applicants for work" in French industries presents the astounding figure of 566 per cent for 1931 over that of 1930. Proportionately this is far greater than that of any other of the 24 European countries tabulated monthly by the International Labor Office.

• BUSINESS ITEMS •

Operations

Motch & Merryweather Machine Co., Cleveland, has been awarded two drill presses on a Wright Field, Dayton, Ohio bid.

Pressed Steel Car Co., Hammond, Ind.. has received an order for 100 steel refrigerator cars from Western Fruit Car Express. This is the second order in 10 days, the first being for 150 steel lumber cars for Northern Pacific.

Machine departments of Four Wheel Drive Auto Co., Clintonville, Wis., are working 24 hours a day in three shifts. Other departments are working will full crews 5½ days a week. The company started the year with the largest volume of commercial orders in its history.

Chicago & Northwestern Railroad is returning 500 men to work at its locomotive shop in Chicago.

JOHN M. SIMPSON, general manager of Warner Gear Co., Muncie, Ind., has announced a large order that will put all three plants in full operation and add 500 men to the payroll.

Allen Mfg. Co., Franklin, Tenn., manufacturer of stoves, has reopened its foundry and enameling plant with enlarged capacity. J. B. BRIGGS has been added as a director.

The Indiana Truck plant, Marion, Ind., will make a 300 per cent increase in production over 1931 beginning March 1.

The locomotive department, Big Four Railroad Shop, Indianapolis, Ind., resumed regular operations Feb. 15 with a full force of 1,200 men. Resumption of operations marked the first activity in these shops since the temporary five-day work period in December.

All types of trains and runs were encountered by this Timken-bearing-axle locomotive during its 21-month, 100,000-mile test run, just completed in Seattle. Operating results were exceptionally satisfactory, according to preliminary reports

New Companies

E. E. BLUNDELL has left Cincinnati Grinders, Inc., to start his own business at 6538 Carnegie Ave., Cleveland. His company is named Commercial Centerless Grinding Co. and is equipped with Cincinnati centerless equipment to handle grinding operations for people in that vicinity who have not sufficient work to warrant the installation of centerless equipment or have work exceeding their capacity.

Abbey Machine & Stamping Corp. has started operations as 122 W. Perry St., Baltimore, Md., and will carry on a general line of machine work, specializing in jigs, tools, machine cutters, dies, molds, metal stamping, pattern work, vending and weighing machines and experimental work. C. L. AMMER is president and manager and I. SILVERSTEIN is vice-president and treasurer.

Plant Purchases

Atlas Mfg. Co., Indianapolis, has purchased the plant at Thirty-fourth St. & Northwestern Ave. formerly occupied by AirMore Products, Inc. The company will manufacture a variety of small metal parts at this plant.

Weir Kilby Corp. has taken over the entire business, name, good will, etc., of Cincinnati (Ohio) Frog & Switch Co. Industrial Plants Corp., Columbus, Ohio, has been engaged to sell at public auction all machinery and equipment of Cincinnati Frog & Switch at 3351 Madison Road, Cincinnati, Feb. 26, on the premises of the plant.

Byer-Anderson Co., Fifth & Y Sts., Sacramento, Calif., and Phoenix Iron & Boiler Works, Twenty-first & R Sts., Sacramento, have consolidated as Byer-Anderson-Stocker Co. and will conduct its business from the plant formerly occupied by Byer-Anderson Co. engaged in boiler, tank, welding and other forms of machine manufacturing, and is owned by LOU A. BYER, E. C. ANDERSON and J. G. STOCKER.

Inland Steel Co. has purchased Mt. Cooper Boiler Co., Tulsa, Okla., one of the largest fabricating plants in the Southwest.

Draper Corp. has purchased at auction the plant and American business of Stafford Co., Readville, Mass.

Connecticut Electric Mfg. Co., Bridgeport, assets were ordered sold to Industrial Managers, Inc., New York, for $175,000. Real estate and buildings were not included. This deal followed a former proposal of $300,000 for the property and a prospective merger with Beardsley & Wolcott, Waterbury, Conn., electrical manufacturing company.

Sun-Up Lamp Works, Inc., has bought the plant at Monson, Mass., formerly occupied by Heimann & Lichten Straw Hat Co. and will manufacture incandescent lamps. The company was formerly located at New York and expects to market about $750,000 worth of lamps yearly. Authorized capital is $100,000. Reconditioning of the plant starts at once with full production anticipated by Sept. 1.

Foundry Equipment Co., Cleveland, Ohio, has purchased the business of McCann-Harrison Co. and will operate the concern as a division with main offices and plant at 1831 Columbus Road, Cleveland. McCann - Harrison manufactures conveyor hearths and standard furnaces of annealing, normalizing and heating types. Foundry Equipment produces core and mold ovens and Swartwout industrial ovens. C. A. BARNETT is president.

A voluntary petition in bankruptcy has been filed in the United States District Court in Grand Rapids, Mich., by De Vaux-Hall Motors Corp., manufacturer of De Vaux motor car. Schedules listed liabilities of $1,830,112 and assets of approximately $2,000,000 with unsecured claims of $1,345,819 and secured claims of $437,700. GEORGE R. SCOTT, vice-president of production, and FRANK G. DEANE, of Grand Rapids Trust Co., have been named temporary receivers. Mr. Scott said the corporation probably would be operated as usual during the receivership proceedings. The company also has a plant in Oakland, Calif.

Plant Additions

Construction of machine shops and roundhouse in the South Klamath (Ore.) yards of Great Northern railroad has been authorized and will probably start as soon as the weather clears, according to an announcement by C. N. CHRISTOPHERSON, general agent. Approximately $100,000 will be spent in the development. Machine shops to be built at that location will be the largest on the Great Northern line south of Spokane.

Expansion of the electrolytic condenser department, as well as installation of new equipment, is announced by WILLIAM DUBILIER, president of Dubilier Condenser Corp., New York City.

Plastic Molding Corp., Newton, Conn., has installed twelve new presses for production of plastic products. This company has been on overtime schedules for a number of months.

Heintz Mfg. Co., Front St. at Olney Ave., Philadelphia, is beginning production of the Heintz window converter, formerly manufactured in Detroit as Car-Kra Windoware.

Sales Offices

Details of a contract with White Co. and the effect the contract will have on production schedules of the Marion, Ind. plant of Indiana Motors Corp. have been made public by H. K. YORK, president of the new company. Describing the contract for sale of Indiana trucks as of major importance, York said that beginning Mar. 1 delivery schedules will be stepped up to about 300 per cent increase over 1931. The company is also developing trucks equipped with Diesel engines as well as manufacture and sale of refrigerator, dairy and milk-hauling vehicles and a new line of school buses.

Frick-Reid Supply Corp., 117 Sandusky St., N. S., Pittsburgh, Pa., has been appointed jobber to handle the G & F line of speed reducers by Gears & Forgings, Cleveland, Ohio.

Synthane Corp., Oaks, Pa., has appointed H. DOUGLAS STIER, 101 Marietta St., Atlanta, Ga., sales representative for the territory of Georgia and Alabama.

C. C. Moore & Co. Engineers and Babcock & Wilcox Co. have announced removal of their offices Feb. 15 to their own building at 450 Mission St., corner of First St., San Francisco.

Howard-Cooper Corp., Seattle, will take over distribution of the Osgood power shovel line in Pacific Northwest.

Canadian Plants

Electrical refrigerators are to be manufactured by Sparton of Canada, manufacturer of Sparton radio and other electrical appliances, at their plant in London, Ont. The company is a subsidiary of Sparks Withington Co., Jackson, Mich.

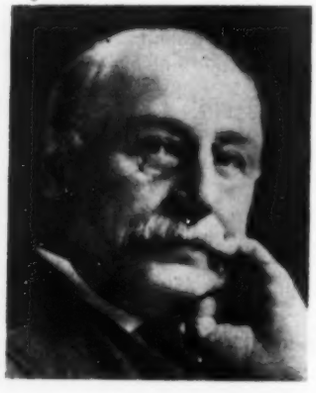
Stockholders of Thomas & Armstrong Mfg. Co., London, Ohio, maker of sheet steel products and steel furnaces, named following officers for the coming year: R. W. BOYD, president; J. F. BALO, vice-president, and C. L. THOMAS, secretary-treasurer. These officers with GEORGE KAUFFMAN and M. B. ARMSTRONG constitute the board of directors. FRED W. MECKELBORG was renamed general manager.

Formation of a new Canadian subsidiary by Simms Motor Units, Ltd., British maker of automotive equipment, and extension of operations of the Toronto factory to include export of batteries to four other dominions and to South America has been announced by Toronto Industrial Commission. The concern occupies a comparatively new plant on Dundas St. West, Toronto.

Wagner Electric Mfg. Co. is a new Canadian subsidiary of Sangamo Co., Toronto, established to manufacture fractional horsepower motors. The company has acquired exclusive manufacturing and sales rights to the products of Wagner Electric Corp., St. Louis, with the exception of automotive equipment. Operations of the new company will be carried on in the Toronto plants of Sangamo Co. ALFRED COLLYER is president and SCOTT LYNN vice-president and general manager.

Reo Motor Car Co., Lansing, Mich., which operated under a similar name in Canada, with a charter granted by the Ontario Government in 1904, after a study and analysis of the Canadian situation, has concluded arrangements with Dominion Motors, Ltd., Toronto, for exclusive manufacture, sale and service in Canada of Reo passenger cars and commercial vehicles.

• PERSONALS •



HENRY E. EBERHARDT celebrated his 80th birthday Feb. 14. Mr. Eberhardt started working at the age of 13, serving a five-year apprenticeship at Ezra Gould, later, with his brother becoming one of the partners in Gould & Eberhardt. Gears then were cut by hand, the operator feeding the cutter by hand and indexing by hand. All the cutters were whittled out by hand also. He began by developing semi-automatic machines for making the cutters used in gear cutting machinery, and then developed gear cutting machines up to the latest type. In 1904 he severed his connection with the old firm and with his five sons formed Newark Gear Cutting Machine Co.

He has always had before him the motto, "To rest is to rust." Although he has been granted patents for a variety of machine tools and printing machines, especially for the printing of money for the United States, he has concentrated most on gear cutting machinery.

Executives—Operating

C. HASCALL BLISS has been elected a director of Nash Motors Co., Kenosha, Wis., to succeed THOMAS M. KEARNEY. Other directors were re-elected.

H. G. DALTON, of Cleveland, has been elected chairman of the board of Youngstown Sheet & Tube Co., succeeding JAMES A. CAMPBELL, 77 year old executive, who has resigned to become emeritus chairman. Mr. Campbell was one of the incorporators of the company in 1900.

ROBERT W. GILLESPIE, president and general manager of Jeffrey Mfg. Co., Columbus, Ohio, has been elected to the board of directors of Jaeger Machine Co., 520 Dublin Ave., Columbus, maker of concrete mixers and similar machinery. GUSTAV HIRSCH, consulting engineer, was also elected to the board. Other directors include LLOYD BROWN, O. G. MANDT, HENRY C. FRAAS, WILLIAM B. SIMPLER, JOSEPH H. MOSEL, GEBHARD JAEGER, LION GARDENER and JOHN ULRICH. LLOYD BROWN was named chairman of the board; GEBHARD JAEGER, president; O. G. MANDT and HENRY C. FRAAS, vice-presidents; JOHN M. ULRICH, secretary, and AUGUST LORENZ, treasurer.

MERRITT GREENE, vice-president of American Machine Products Co., Marshalltown, Iowa, has been elected president to succeed E. A. FRANCIS, who last week resigned as president and treasurer and withdrew from active management. JAMES JENSEN, JR., recently made secretary-treasurer, will assume direct supervision of the company's affairs. Mr. Francis has not announced his plans for the future.

E. O. PERRY of Auburn, Ind., has been elected a director of Auburn Automobile Co. in place of R. H. FAULKNER, who resigned some months ago.

E. T. BARRON, metallurgist, and J. O. LEECH, manager, bureau of inspection and tests of the metallurgical department of Carnegie Steel Co., Pittsburgh, have been advanced to assistant metallurgical engineer. G. ELKINS KNABLE, metallurgist in the metallurgical department has been appointed manager, bureau of inspection and tests, in this department.

BONIFACE A. MILLER, formerly metallurgist, Bartlett-Hayward Co., and American Hammered Piston Ring Co., Baltimore, has been made metallurgical engineer, James J. Lacey Co., Baltimore.

Sales

FRED ARCHER, formerly president of Fred Archer, Inc., has been appointed in charge of motor sales for the Philadelphia office of Lincoln Electric. Mr. Archer was with White Motor Co. and Kelly-Springfield Tire Co. before forming his own company.

FRANK J. DUMARS has joined the sales staff of the machine & small tools divisions of Barber-Colman Co., Rockford, Ill., as representative for central western states, specializing in dies, jigs and fixtures. Mr. DuMars was previously connected with Reynolds Engineering Co., Rock Island, Ill., in a sales capacity.

H. E. GALVIN, formerly associated with Crane-Schiefer-Owens, Inc., metalworking machinery dealer, has resigned to start a similar business to be known as Galvin Machinery Sales, with offices at 500 Brisbane Bldg., Buffalo, N. Y.

B. F. MCINTYRE has joined the Chicago office of Lincoln Electric Co. in charge of motor sales for the Chicago district. He was formerly with Industrial Controller Co., Milwaukee.

Activities

C. W. HEPPENSTALL, president of Heppenstall Co., Pittsburgh, has been elected president of Forging Manufacturers' Association at the annual meeting in the Engineers' club, New York City. R. F. DEVINE, JR., of Erie Forge Co., Erie, Pa., was named a vice-president of the association, as was C. E. WILDER of National Forge & Ordnance Co., Irvine, Pa. C. E. FINKL, of the A. Finkl & Sons Co., Chicago, was elected treasurer. W. J. PARKER, 7 E. 44th St., New York, is commissioner of the association.

E. E. GRIEST, vice-president in charge of manufacture of Chicago Railway Equipment Co., Franklin (Pa.) Steel Works, Marion (Ind.) Malleable Iron Works, and Grand Rapids (Mich.) Malleable Iron Works, has been elected president of Malleable Iron Research Institute.

HARRY A. KIDDER, superintendent of motive power, Interborough Rapid Tranits Co., New York City, has been elected president for 1932 of United Engineering Trustees, joint agency of the four Founder Engineering Societies. He is also chairman of the Finance Committee of the Professional Engineers' Committee on Unemployment, and a fellow of A.I.E.E., which he represents on the Administrative Board, American Engineering Council. HAROLD V. COES, consulting management engineer of Ford, Bacon & Davis, and COL. ARTHUR S. DWIGHT, president

of Dwight & Lloyd Co., were named vice-presidents. DR. ALFRED D. FLINN, director of Engineering Foundation, will serve as secretary, and CLIFFORD P. HUNT, vice-president of Chemical Bank & Trust Co., as treasurer.

G. F. McDOUGALL, consulting mechanical engineer of Portland, Ore., has been elected vice-president for the coming year of Oregon Technical Council consisting of representatives of all major branches of engineering in the state. The chief function of the Council this year will be to direct the engineers' relief organization recently formed.

W. A. OLEN, president and general manager of Four Wheel Drive Auto

Co., Clintonville, Wis., has been elected to the board of directors of Manufacturers' Division, American Road Builders' Association. He has been president and general manager of Four Wheel Drive since 1910.

Speakers

J. H. LANSING, works manager, Danville malleable iron division, Allith-Prouty Co., Danville, Ill., and W. G. HANAWALT, assistant superintendent of George H. Smith Steel Casting Co., Milwaukee, will be speakers at a joint meeting of the Chicago Foundrymen's club, Western Society of Engineers, Chicago section of A.S.M.E., and Chicago Foundrymen's Association, Feb. 8. The general subject will be "Foundry Factors Affecting Design of Castings."

J. I. OVERMAN, secretary of Feenaughty Machinery Co., for several years in Portland, Ore., will make his headquarters in Seattle. He recently addressed the January meeting of Associated Equipment Distributors of Seattle on the outlook for 1932.

D. W. REESE of Whiting Corp., Harvey, Ill., will address the Chicago Foundrymen's club Feb. 4 on rotary furnaces in melting cast metals.

W. E. SANDERS, chief metallurgist and plant engineer of Muncie Products Corp., Muncie, Ind., gave an illustrated lecture on research conducted on steel and forging and greater density, machinability and durability at the last meeting of the chapter there of A.S.S.T. This is a newly organized chapter, including members from Muncie, Newcastle and Anderson, Ind.

• OBITUARIES •

HOLLY T. ARMSTRONG, 43, manager of sales of Montreal Locomotive Works, Ltd., and Canadian Steel Car & Wheel Co., died at his home in Montreal, Feb. 2.

JOHN D. BALDWIN, SR., 57, superintendent of Weatherhead Co., Cleveland, automotive parts maker, died suddenly of heart disease there Jan. 29. He was formerly connected with Bishop & Babcock Mfg. Co.

FRANK C. CASE, 77, formerly president and chairman of the board of Lamson & Sessions Co., Cleveland, Ohio, died Feb. 1 there after a six months' illness.

JAMES DAVIS DOWNING, 68, founder of Meadville (Pa.) Malleable Co., died recently in Washington, D. C., following a six weeks' illness.

EZRA CHARLES FITCH, 84, associated with Waltham Watch Co., Boston, for 67 years, died there Feb. 3.

JOHN FLETCHER, 76, mechanical engineer who had invented many safety devices for elevators, died at his home in Philadelphia, Feb. 7, of a lung ailment which developed from a cold.

DR. JOHN BROWN HERRESHOFF, 81, leading metallurgical chemist of the United States, and past president of American Chemical Society, died in Atlanta, Ga., Jan. 30.

ENGELHARDT W. HOLST, consulting engineer and formerly affiliated with General Electric Co., Schenectady, N. Y., died Feb. 1 at his home in Mt. Vernon, N. H.

COL. ARTHUR KEMP, 58, Buffalo manufacturer of stamps and dies, died Jan. 29 there following an operation.

G. S. BREWER of Mettrick Metal Co., Erie, Pa., has been elected secretary and treasurer of the Erie section, American Chemical Society.

HENRY A. LANDSBURG, 72, for nearly 50 years connected with the manufacturing dept., Otis Elevator Co., New York City, died Jan. 31 in Yonkers, N. Y.

JACOB C. MATTERN, 66, assistant superintendent in charge of equipment at the Elizabethport (N. J.) plant of The Singer Manufacturing Co., died Feb. 7 of injuries suffered in an automobile accident.

CHARLES E. ROGERSON, 76, vice-president of Saco-Lowell Shops, Biddeford, Me., and Kitson Machine Shop, died suddenly at Boston, Mass., of angina pectoris. He was also president of Nevins Co., and a director of a number of companies.

JOHN H. SCHAUMLEFFEL, 73, a founder of the old Marion (Ind.) Gray Iron Foundry, died suddenly recently. He had retired some years ago when Atlas absorbed the company.

WILLIAM F. SCHWEIGERT, 59, secretary of Niagara Machine & Tool Works, Buffalo, N. Y., died at his home Feb. 9. He had been identified with the sales activities of the company for over forty years and was particularly well known in the steel barrel manufacturing industry.

HERBERT SLACK, president of Wentworth Radio Corp., died in a hospital in Hamilton, Ont., Jan. 25.

CHAS. W. SMART, 84, who held patents on numerous inventions and had formerly been active in the heating, iron and mechanical trades around Memphis, Tenn., died there Jan. 30.

DR. HAROLD B. SMITH, 62, for thirty-five years head of the Department of Electrical Engineering of Worcester Polytechnic Institute and former president of the A.I.E.E., died in Worcester, Mass., Feb. 9. He had been in poor health for several years. He retired from the faculty in 1930.

LEWIS LEADS TATUM, 58, purchasing agent, Cutler-Hammer Inc., Milwaukee, Wis., from 1923 to 1930, and previously assistant chief engineer, died Feb. 7 after a long illness. He joined the engineering staff of Bullock Electrical Mfg. Co., Cincinnati, immediately after graduation in 1897 and remained there until 1906, when he joined Cutler-Hammer.

FRED WARNER, 66, at one time president of the Oakland division of General Motors, died in Clearwater, Fla., Feb. 14.

• MEETINGS •

AMERICAN MANAGEMENT ASSOCIATION
Packaging, packing and shipping exposition, Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., Chicago, or 20 Vesey St., New York.

AMERICAN WELDING SOCIETY
Annual meeting, Engineering Societies Bldg., New York, Apr. 27-29. William T. Spraragen, secretary, 29 W. 39th St., New York City.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention, American Foundrymen's Ass'n, Philadelphia Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL MACHINE TOOL BUILDER'S ASS'N
Third National Machine Tool Show. Cleveland (Ohio) Municipal Auditorium, Sept. 10-17. Boyd Fisher, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eisenman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ariz., Venezia — Westener Gold-Lead Mines Co., E. L. Tomlinson, Pres. and Mgr., plans installation of 350 hp. Diesel engine, four air compressor plants and 1,000 ton flotation mill.

Calif., Los Angeles—Willard Storage Battery Co., 5700 East 9th St., awarded contract for addition to storage battery plant including erection of lead-oxide mill, acid reclaiming plant and enlargement of administration building. Estimated cost $100,000. Noted January 28.

Conn., Newington — Veterans Administration Bureau, Washington, D. C., will receive bids until March 8 for 1 story addition to garage building No. 3 at Veterans Administration Hospital here. Private plans.

Conn., New London — Alfred Mitchel Woods Associates, Inc., c/o Payne & Keefe, 231 State St., Archts., awarded contract for construction of a 2 story, 35 x 90 ft. field house, including garage, work shop, boiler room, etc. Estimated cost $25,000.

Md., Baltimore—John M. Reiser & Sons, 620 Portland St., plans construction of a 1 story cooperage plant, 15,000 sq.ft. of floor space, at Charles and Wells Sts.

Mass., Cambridge (Boston P. O.) — School Commission, awarded contract for construction of Rindge Technical high school at Broadway and Irving St. Estimated cost $1,500,000. Noted January 28.

Mass., Fall River—Cherry & Webb Co., 149 South Main St., awarded contract for reconstruction of industrial building. Estimated cost $50,000.

Mass., Newton—Shell Eastern Petroleum Products Inc., 141 Milk St., Boston, receiving bids for a 1 story service station at Beacon and Walnut Sts. here. Estimated cost $25,000. Private plans.

Mass., New Bedford—George A. Emin, 1098 Purchase St., completed plans for addition and alterations to garage. Estimated cost $40,000. F. A. Walker, 227 Union St., Archt.

Mass., Pittsfield—Pittsfield Auto Body Works, 14 Gordon St., plans construction of a 2 story repair shop. Estimated cost $40,000. Architect not selected.

Mass., Shrewsbury — Department of Public Works, receiving bids for erection of 1 story garage and shop. Estimated cost $40,000. A. J. Daniels, 661 Main St., Engr.

Mass., Somerville (br. Boston)—Standard Oil Co. of New York, Park Sq. Bldg., Boston, receiving bids for erection of a 1 story service station at Northern Artery and Greenville Sts., here. Estimated cost $25,000 to $30,000.

Mass., Springfield — General Electric Realty Corp., River Road, Schenectady, N. Y., will receive bids until February 26 for construction of a 2 story, 100 x 125 ft. sales and service station at 278 King St. Estimated cost $250,000. Private plans. Noted February 4.

Mass., Springfield—Sanford Tire Corp., J. S. Coughlan, 34 Sanford St., having plans prepared for construction of automobile tire service station at Gardner and Main Sts. Estimated cost $40,000. Private plans.

Minnesota—Commission of Administration & Finance, C. T. Erickson, Comr. of Purchases, 10 State Capitol, St. Paul, awarded contract for construction of two state highway patrol stations and garages at Brainerd and Mankato. Noted January 28.

Minn., Granite Falls—Granite Falls Garage and Master Tire Co., plans to rebuild 1 story service garage and tire shop recently destroyed by fire.

Mo., Kansas City—Universal Building & Construction Co., c/o Sam Benjamin, Transcontinental Highway Hotels & Amusement Co., lessee, will build a 60 x 160 ft. hotel including 60 x 190 ft. dining hall, 50 x 160 ft. garage, and 30 x 30 ft. service station, etc., near here. Estimated cost $225,000. Victor J. DeFoe, 114 West 10th St., Archt. Work will be done by owner's forces.

Mo., St. Louis—Kroger Grocery & Baking Co., A. S. Grogg, Gen. Mgr., 3801 Vista Ave., St. Louis, and 35 East 7th St., Cincinnati, O., will receive bids until February 29 for construction of a 4 story, 85 x 190 ft. bakery and 1 story, 43 x 63 ft. garage consisting of boiler room, salvage room, also extensive alterations to existing building including loading dock, etc., at 1311 South 39th St. Estimated cost $700,000. Emil E. Niemann, 3816 Shaw Ave., St. Louis, Archt.

Nev., Las Vegas—J. F. Hesse & Associates, c/o Warner & Nordstrom, Las Vegas, Archts., having preliminary plans prepared for 120 x 140 ft. garage building. Estimated cost $40,000.

N. J., Elizabeth—Board of Education, 417 South Broad St., having plans prepared for construction of a 2 story boys' vocational school. Estimated cost $150,000. Architect not selected. Maturity in April.

N. J., Jersey City—Lafayette-Greenville Bus Owners Association, and Greenville Bus Co., 77 Seaview Ave., completed plans for construction of a 1 story garage building and bus terminal at Merritt St. and Gates Ave. Estimated cost $150,000. Harry Adelman, 437 Broadway, Bayonne, Archt. Noted December 17.

N. J., Jersey City — Owner, c/o Barney D. Singer, 921 Bergen Ave., Archt., completed preliminary plans for a 1 story addition to machine shop on Hill St. Estimated cost $40,000. Noted December 24.

N. J., Lakehurst—Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded contract for a 1 story gas cell shop and storage building at Naval Air Station here. Estimated cost $200,000.

N. J., Newark—Superior Air Products Co., 182 Malvern St., having plans prepared for a 1 story addition to factory for the manufacture of riveters, drills, pavement breakers, etc. Estimated cost $40,000. Architect not selected.

N. J., Newark—Unique Arts Manufacturing Co., 196 Waverly Ave., completed revised preliminary plans for a 2 story factory. Estimated cost $75,000. Saul Shaw & Co., 24 Commerce St., Archt. and Engr. Noted August 6.

N. Y., Brooklyn—B. Greenberg, 4902 Foster Ave., will receive bids after March 15 for construction of a 1 story, 95 x 150 ft. service garage at Hegeman Ave. and Malta St. Estimated cost $40,000. S. F. Oppenheim, Inc., 26 Court St., Archt. Noted January 28.

N. Y., Long Island City—Patterson Sargent Co., 135 East 42nd St., New York, having plans prepared for construction of a 28 x 66 ft. tank house at 31st Pl. and Borden Ave. here. Private plans.

N. Y., Ozone Park—Beanro Service Station, Rockaway Blvd. and 130th St., having sketches made for construction of a 1 story, 38 x 82 ft. service station. A. Goldberg, c/o owner, Archt.

Pa., Franklin—Venango Manufacturing Co., First St. and Liberty Ave., subsidiary of Franklin Railway Supply Co., 60 East 42nd St., New York, N. Y., receiving preliminary bids for construction of a 1 story, 260 x 300 ft. and 200 x 260 ft. automobile manufacturing and assembly plant on Liberty Ave. Estimated cost $750,000. Milton Hefferman, First St. and Liberty Ave., Franklin, Engr. Noted February 4.

Pa., Landingville — Philadelphia & Reading Coal & Iron Co., Reading Terminal, Philadelphia, plans to rebuild experimental briquette plant here destroyed by fire.

Pa., Pittsburgh—Norton Company, O. Anderson, Mgr., 338 Third Ave., manufacturers of grinding wheels, new plans completed and will receive bids about May 1 for construction of a 3 story, 70 x 100 ft. warehouse, and 1 story, 21 x 41 ft. garage designed for two additional stories, on Carson St. Ballinger Co., 105 South 12th St., Philadelphia, Archt. and Engr. Noted September 10.

Tex., Beaumont—Commercial Pulp & Paper Co., c/o C. A. Kieren, arranged to take over plant of Yellow Pine Paper Co. and plans improvements consisting of new incinerators, disc evaporators, waxing machinery, etc., 10,500 tons of paper annual capacity. Estimated cost $125,000. Private plans.

Utah, Siguard—Jumbo Plaster & Cement Co., plans to rebuild gypsum plant destroyed by fire. Estimated cost $250,000.

Vt., Newport — Bradley Auto Sales Inc., awarded contract for rebuilding 1 story sales and service garage. Estimated cost $40,000.

Va., Alexandria—Ford Motor Co., Schafer Road, Dearborn, Mich., will receive bids about February 20 for construction of a plant including distribution and service building, etc., here. Estimated cost to exceed $100,000. Albert Kahn, 1004 Marquette Bldg., Detroit, Archt. Noted February 4.

W. Va., Chester—E. C. Otis Manufacturing Co., Toronto, Ont., acquired a site and plans construction of a 1 story, 50 x 184 ft. factory for the manufacture of built up roofing and building paper here. Estimated cost $60,000. Private plans.

Wis., Eau Claire—Schuttle & Weathern, will build a 1 story repair and service garage. Estimated cost $15,000.

Wis., Milwaukee—Filer & Stowell Co., 147 East Beecher St., manufacturers of saw mill machinery, engines, and castings, awarded contract for a 1 story, 63 x 168 ft. addition to foundry.

Wis., Manitowoc—Manitowoc County, Edward Berkedal, County Highway Engr., will receive bids until March 2 for a 2 story, 70 x 300 ft. machine repair shop and storage shed. Estimated cost $40,000. Smith & Brandt, Manitowoc and Appleton, Archts.

Wis., Rice Lake—Rice Lake Cheese Box & Mfg. Co., c/o Frank Ruttner, plans to rebuild box factory recently destroyed by fire. Estimated cost $40,000.

Ont., Hamilton—British American Oil Co., Royal Bank Bldg., Toronto, plans construction of a 1 story, 40 x 130 ft. warehouse and 60 x 80 ft. garage, five oil and gasoline storage tanks, etc., at Wentworth and Ottawa Sts. here. Estimated cost $50,000. Private plans.

Ont., Toronto—McQuay-Norris Manufacturing Co., William K. Norris, Pres., 2320 Cooper St., St. Louis, Mo., acquired a site and plans addition to piston ring plant here. Estimated cost $1,500,000. Maturity indefinite.

Que., Scotstown — Greif Brothers Cooperage Co., 2000 West 25th St., Cleveland, O., having plans prepared for construction of two large sawmills and barrel manufacturing plant here. Estimated cost $200,000.

T. H., Pearl Harbor — Bureau of Yards & Docks, Navy Department, Washington, D. C., received lowest bid for construction of building for engine and aircraft overhaul shop at Naval Operating Base, Air Station here, from Newport Contracting & Engineering Co., Lee Hall, Va. $148,000. Noted December 31.

United Socialist Soviet Russia—United Construction Equipment Industry, Division of Soviet Government, c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will build a plant for the manufacture of excavating equipment at Tashkent in Ural district. Work will be done by day labor and technical aid contracts.

Equipment Wanted

S. D., Brookings—City—will purchase one traveling crane.